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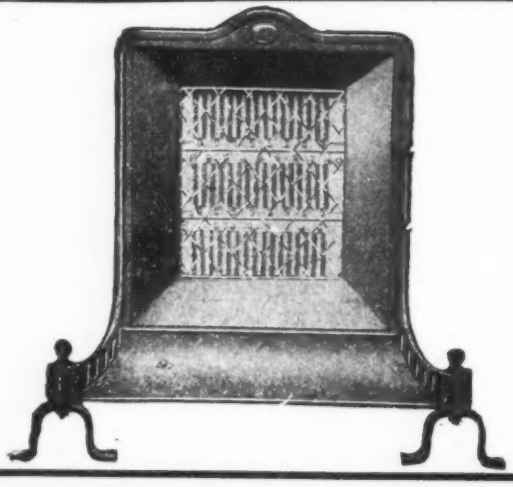

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ELECTRICAL REVIEW.

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THE DOMESTIC APPLICATIONS OF ELECTRICITY.

NEVER before have the conditions been so favourable to an enormous development of the applications of electricity to domestic purposes as they are now—not merely as they are *going* to be, but *now*. It may be useful, as it is certainly timely, to draw attention to some of the factors which, in our opinion, have established these conditions.

In the first place, the insistent demand for more and more electric power for the manufacture of munitions has come to an end; our future needs in this respect will be trifling in comparison with those of the strenuous years that have passed, and while the operation of changing over to peace-time production is in progress, the uncertainty of conditions in the labour world, the delay of the Government in defining its future industrial policy, the high cost and scarcity of raw materials, and other opposing elements, all tend to hamper and defer the resumption of industrial activity on the extended scale that we look forward to. Hence there is at present a considerable surplus of available power in most districts. Not only is this the case, but also many large extensions of plant which were being carried out during the war, and others which have been put in hand, are approaching completion, thus further adding to the excess of supply facilities over the needs of industry.

Next, the war has given a tremendous advertisement to the elasticity, universal applicability, convenience, and economy of electricity in its innumerable uses, and has not only taught the general public what it can do, but has even educated the Government to a realisation of its necessity to the social and economic life of the nation, with the result that Parliament is considering proposals for the development of electricity supply throughout the whole country. The extended and successful use of electric cooking in national kitchens, in large works canteens, and elsewhere during the war, has greatly helped on this application, and the demand for electric heating apparatus has grown amazingly.

Again—and this is one of the most important factors—the domestic servant situation has assumed an entirely new phase. No doubt it will be materially modified as time goes on, but no one will suggest that pre-war conditions will ever return in this respect. Domestic help in future will always be far more costly than in the past, and at present it is, to a vast number of the public, at a prohibitive figure. The obvious corollary, as in the case of the organisation of factories to meet the new conditions, is that mechanical power must be substituted as far as possible for manual labour; the housewife must seek the assistance of the electrical engineer to solve the problems of domestic economy.

Without further labouring the point, we claim to have shown that our introductory assertion is well-founded.

What follows? What are we doing about it? and what can be done to cope with the requirements?

Up to the present, though we have made excellent progress with the development of electric cooking and heating apparatus, we have done little else to cater for the needs of the housewife. In this connection we are 20 years behind the United States, which found it necessary long ago to seek a solution for the domestic labour problem, and found it in electricity. Some years ago, Mr. R. Borlase Matthews came to the rescue of the housewife with his "Electric Mary Ann"—a portable combined electric motor and driving gear, so arranged that one apparatus could drive any standard domestic labour-saving machine*; the idea was ingeniously worked out, and may prove extremely useful in many cases. Electrically-driven washing and ironing machines, baking machinery, potato peelers, &c., have been widely used in laundries, hotels, and other large business premises, but, as a rule, they are ordinary machines to which the electric-motor drive is merely incidental, and the machines are not designed specially with electric driving in view. In the United States, on the other hand, the electric drive forms an integral part of the design, as it should, and a great variety of electrical machines—washers, wringers, refrigerators, dish-washers, &c.—has been on the market for years; we give elsewhere in this issue a number of examples of such apparatus, and wish to emphasise the fact that they are in no sense "novelties," but are firmly established in domestic use. There is an immense field for development in this business, and it will be seen at once that the great bulk of the demand would fall in daylight hours, entailing no addition to the capacity of the existing generating plant and mains, while the demand would have a high diversity factor and would greatly improve the load factor of the power station. Moreover, in this field our gas friends are unable to compete with us.

Now is the time for British manufacturers to "get busy" with this proposition. We may have to depend on American imports for a time—the import restrictions have been largely removed—but, as in the case of electric tramway equipment years ago, we shall soon be able to supply our own requirements, and to develop an export trade in addition.

Turning to the heating and cooking question, which is already the subject of keen enterprise and admirable manufacturing ability in this country, we may draw attention to a significant movement on the part of our rivals the gas engineers. A big combine has been registered, under the title "Radiation," Ltd., with a capital of £2,750,000, to purchase the businesses of the Wright, Richmond, and Davis gas stove makers, and others; obviously we may expect, therefore, the standardisation and cheapening of gas cooking and heating appliances, and increased rigour of competition with electrical apparatus. According to *The Times*, the directors state that such a union of interests is essential in view of the unexampled difficulties of manufacture under present conditions, the substantial economies that will be effected by eliminating competitive expenditure, the avoidance of duplication, and the benefit of mass production and standardisation. All these considerations apply, with even greater force, to the manufacture of electrical heating and cooking apparatus, which at present is in its youth and is carried on upon a relatively small scale by individual firms. In these pages we have repeatedly urged the standardisation of electrical cooking and heating apparatus, *so far as it is practicable*—for the course of evolution must not be hindered by an excess of standardisation: the construction of heating elements, for example, is constantly being improved, and the elements themselves cannot be standardised, but there is no such objection to the fixing of standard sizes of elements, shape and distance apart of terminals, &c., to enable the householder to replace elements without trouble or difficulty. In view of the new gas combine, we suggest a further step—the formation of an association, if not a combine, of cooking and heating apparatus makers, to co-operate in producing the most efficient electrical apparatus on the most economical lines of production, in order to bring down the cost of the equipment to the lowest possible amount. Further, we think the coming autumn would be a most favourable time for the holding of an Exhibition in London devoted wholly to the actual demonstration of such apparatus, together with any other electrical labour and fuel-saving devices that can be brought together. The Coal Controller has announced the necessity of continuing the rationing of coal, gas, and electricity, and there is no doubt that by the adoption of electrical methods not only will the householder be assisted in keeping within the ration, but also the total quantity of fuel consumed will be diminished. Steps should be taken publicly to demonstrate the fact last mentioned.

We have no doubt that the Electrical Development Association will cordially support all efforts of this nature; but "Eda" is as yet youthful and unorganised, and her present capacity for work is doubtless limited. We therefore urge the manufacturers and sellers of domestic electrical apparatus themselves to get a move on, for the matter is very urgent.

* ELECTRICAL REVIEW, March 11th, 1910, p. 384.

Business Influenza.

UNDER this title there recently appeared in *Ways and Means* a most interesting article on the very prevalent slackness of to-day. This slackness is by no means confined to the wicked Trade Unionist, and is not exclusively the result of the malign activities of Labour agitators. It may be found amongst "respectable suburbanites and proud adherents of the worst forms of Toryism and mediævalism," such as draughtsmen, city clerks, and typists—and even in the Post Office. Before the war, we are reminded, a 20-year-old typist of real efficiency was paid 27s. 6d. a-week; to-day, without the efficiency, she receives £2 10s. Overhead charges have increased as well; her desk, chair, and cabinet are worth £20, instead of £5, and her machine, which cost £21 new, is now worth £50 second-hand. On the top of all this, she gives half the pre-war output of letters, and encumbers the telephone with her social engagements. As our contemporary summarises it: "Trade is, after all, a mere matter of exchange, and it is a little hard to see how the account is likely to work out when a young woman gives in exchange for silk stockings and everything else to match, with a bowl of flowers thrown in, a matter of ten or a dozen badly-done letters in the course of a day. Such a bargain is entirely fictitious, and has in it the seeds of disaster somewhere."

All of this is very true, and we are glad to read it; but why end with the typist? Those of us who are honest are bound to admit that it goes against the grain to do a good day's work ourselves. Although we would deny it were another to say it, we have *not* our old keenness; it is a labour to carry on from day to day, even from hour to hour, with the routine of life. We say we are contending with greater difficulties—shortage of material, labour troubles, uncertainty as to what the next week will bring forth or what fresh folly the Government will commit. Difficulties do exist, but many of them we ourselves can overcome; most of them are caused only by other people being as slack as we are ourselves. There is a complete absence of well-directed endeavour, and the result is nerveless invertebrate dilly-dallying. Business is allowed to trickle through our works, and an effort to hurry delivery from contractors only produces, like the typist, "ten or a dozen badly done letters" of excuse.

We are at an *impasse*. It is useless to blame the community, because it is individual effort that is lacking. It is useless to blame the individual, for each is as bad as the other. It seems to be high time for the whole world to have a cold bath.

DOMESTIC ELECTRICAL APPLIANCES.

In our leading article to-day we draw attention to the importance of developing the demand for electricity in the household, and the unique opportunity afforded by the present conditions for extending the scope of its applications to labour-saving apparatus in this country. To point our remarks, we have thought it well to bring together a number of such devices which are in use in the United States, by way of illustration and to indicate the variety and degree of development to which they have attained in that country, where this branch of the industry has been cultivated for many years. For the examples given below, we are indebted to the *Electrical World*, and the *Electrical Review* of Chicago. We give a selection only, from numerous types :—

Clothes-Washing Machines.

Fig. 1 shows an electric washing machine for use in residences, &c., with an automatic safety stop on the power wringer by means of which, if clothes wind around the rubber rolls or if the operator should catch her fingers between the rolls, the wringer is automatically disconnected from the driving motor. The machine is practically "foolproof," and thus all danger as far as operation is concerned is completely eliminated. The tub is driven by means of a belt operating two revolving gears, which pull the washing tub forward and backward, creating oscillating motion. It is driven by a ¼-H.P. motor which may be fed from any lighting circuit. The cost of operating the motor is from 1 cent to 1½ cents an hour, according to the price of energy.

Fig. 1.—Foolproof Electric Washer.

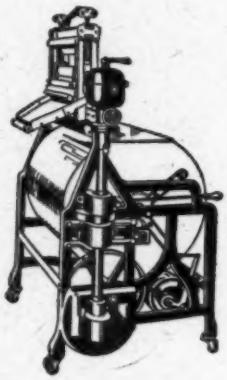

Fig. 2.—Noiseless Machine with Safety Features.

Fig. 2 shows an electric washing machine over which the operator has absolute control at all times; the wringer can be stopped, started, or reversed at will, and is provided with a safety relief for use in case of emergency. The washer can also be started or stopped, as desired, while the wringer is in operation. In addition, an electric switch is provided on the washer for stopping the entire machine when desired.

The tub made for this electrical washing machine, which is built of copper, polished on the outside and tinned on the inside, moves on central bearings, and is so designed that the oscillation of the tub forces the hot suds through the garments. The machine is driven by a motor rated at ¼ H.P.

Fig. 3 represents a platform washer which has a peg-type dasher. It not only does the washing, but takes care of rinsing, wringing and draining as well, without the necessity of lifting the tubs either during the washing or after it is finished. The sliding wringer attachment and the drain from the tub make this heavy labour unnecessary.

The sliding-wringer feature makes it possible to operate the wringer in either direction from any place on the bench. Double control gives the user convenient speed and safety in operation. The hand lever placed conveniently at the top of the side frame enables the operator to start, stop or reverse the wringer by hand alone. A foot attachment is also provided which permits the operator to use both hands in rinsing the clothes and in feeding the wringer, starting and stopping the wringer at will by application of slight pressure on the foot treadle.

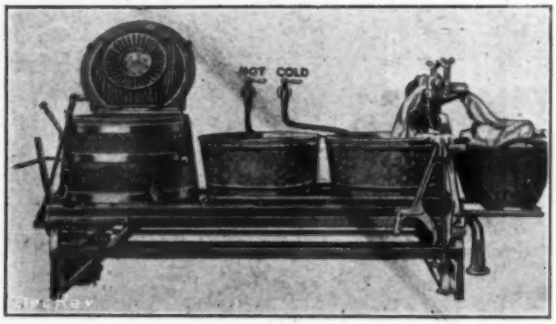

Fig. 3.—"Platform" Washer.

Fig. 4 shows an electric washing machine which has an inverted cone-shaped device projecting below the usual "dolly" agitator in the centre of the tub. Through its use the clothes are kept from collecting in a heap in the centre of the washer, and are forced into a wide circle and a greater volume of water, the slant of the cone causing the water to be greatly agitated. In this way hot soapsuds are forced through the clothes.

With the exception of the tub, made of Southern cypress, the entire machine, including the double folding platform for two extra tubs, is constructed of metal. All the machinery and gearing are enclosed and out of the way. Attached to the transmission gears is a small pulley, which may be used to run an ironing machine or other labour-lightening devices. A lever, conveniently located, controls the operation of the washer, another feature of which is the three-position, tilting, ball-bearing wringer having tension springs to adjust the rolls for thick and thin clothes and a positive safety release which unlocks the top roll when lifted.

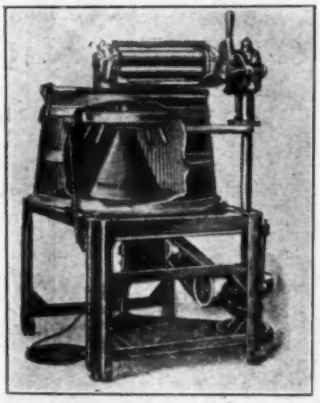

Fig. 4.—Washer with Internal Cone.

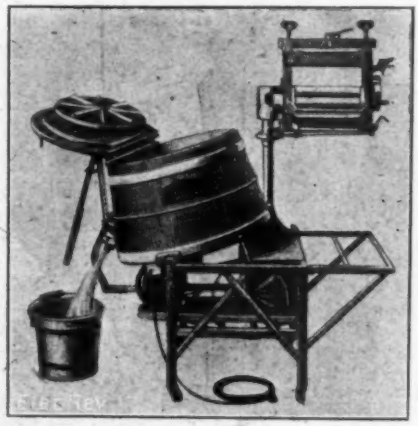

Fig. 5.—Washer with Tilting Tub.

Fig. 6.—Vacuum-type Washer.

The variety of motions provided for in these washers is well illustrated in fig. 5, which speaks for itself; this machine has a tilting tub, which is claimed to save much time and to drain itself rapidly and completely.

The frame and folding bench are of rust-proof galvanised steel; the wringer swings to four positions, and has reversible rolls; cut gears are used, and the drive is by belt from the motor.

Fig. 6 is a totally different type, in which the tub forms the body of the machine, the ¼-H.P. motor being fixed below it. The gears are cut, the wringer is reversible and has three positions, and the washer is of the so-called "vacuum" type—*i.e.*, with a conical plunger.

A totally different type again appears in fig. 7, which shows a combined clothes washer and drier. Two separate machines—a washing cylinder and a centrifugal extractor—are mounted on one frame; the frame is made of steel throughout, while the two tanks are of vitreous porcelain. In one of the tanks the washing cylinder, of perforated brass, revolves at a speed of 35 R.P.M., and in the other tank the extractor operates at 1,500 R.P.M., which removes the water from the clothes in from three to five minutes and leaves them just damp enough for ironing. A ball-bearing motor is used, and the friction-drive mechanism is said to prevent shock to the driving parts and to prolong the life of the motor. This machine can be used for washing and drying separately, or both at the same time.

It is suitable for large families, small hotels, hospitals, &c.

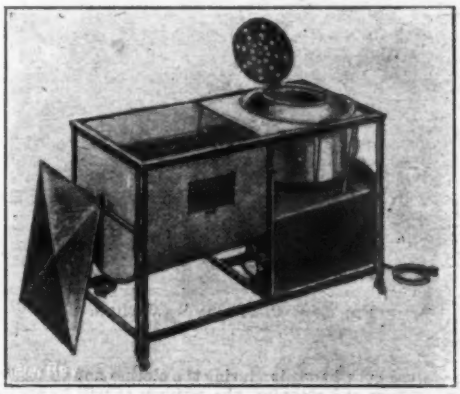

Fig. 7.—Combined Washer and Drier.

Lastly, in fig. 8 we have the "locomotive" type of washer, a new device, in which the washing is effected by causing the tub to reciprocate on a horizontal runway forcing the water through the fabric of the clothes; there are no moving parts inside the tub, which makes 60 strokes a minute. The tub is of copper or

Fig. 8.—Locomotive Washer.

galvanised iron, and is kept hot by a burner beneath it. A swinging wringer with a safety attachment is provided.

Ironers.

Fig. 9 represents an ironing machine, which can do a big family ironing in one hour, costing only 3 cents an hour for energy, and doing the work far better than by hand.

Fig. 10 shows an electrically heated and driven ironing machine; the motor is fixed underneath, where it is quite out of the way and where the belt is in no danger of getting entangled with clothes. Pilot lights next to the three-heat snap switches controlling the heating units afford a complete indication of the amount of heat being used. In the smaller sizes of these ironers there is only one heating unit, but in the 42 to 56-in. sizes there are two, one for each half of the ironing shoe. This divided heating element feature makes for economy in ironing small pieces, since only one side of the ironing machine need be used.

Dishwashers.

Machines for washing dishes are, perhaps, too expensive and elaborate for household use, though there is probably no domestic duty which bears so heavily upon the unassisted housewife as "washing-up," and the inventor of a cheap and suitable device to lighten this labour would be hailed as blessed by countless British matrons, the victims of domestic drudgery. But hotels and restaurants require such machines. In one type, with a capacity of about 12,000 plates per hour, the dishes are fed into one end of the machine, travel on a belt conveyor, sprayed from above and

Fig. 9.—Electric Ironing Machine.

below by washing and rinsing water, and come out cleaned at the other end.

A 2-H.P. motor is directly connected to the driving shafts of two centrifugal pumps, which elevate the washing and the rinsing water to the sprays from two cast-iron tanks below the dish conveyor. The machine is said to be easily operated, since the water is renewed automatically, the operator's duties consisting of feeding and unloading the dishes.

No baskets are used for the dishes, these being placed directly on the conveyor, but mesh-wire baskets are used for washing

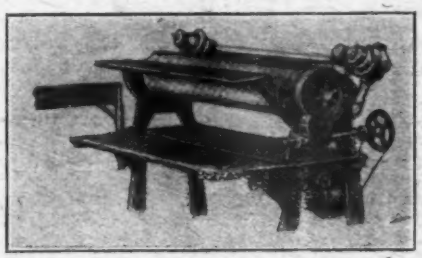

Fig. 10.—Electrically-Heated Ironing Machine.

silverware. Removable doors enclose the entire mechanism, glass windows being provided in front so that the operation of the machine may be observed by the attendant. Beneath the conveying belt are placed perforated screens which catch all particles of food washed from the dishes. Another and finer screen is placed over the pump channel to prevent food-stuffs from being drawn into the pumps and sprayed back on the dishes.

Many types of machines for this purpose are sold in the United States, with capacities from 3,000 to 15,000 dishes per hour. One

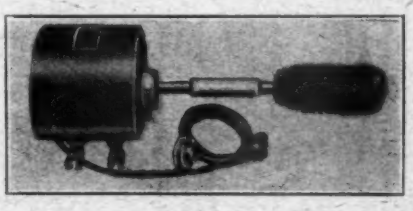

Fig. 11.—Electric Milk-Bottle Washer.

which deals with 5,000 dishes per hour occupies a floor space (apart from the receiving and drying tables) of only 2 ft. × 3 ft.; the dishes, &c., are placed in baskets, which are rotated by a ½-H.P. motor. For washing milk bottles in dairies an electrically-driven bottle washer is made, as illustrated in fig. 11; this machine is mounted so that the brush rotates over a tub of water. The bottles are filled about half full of water and forced over the brush

which rotates at a high speed, coming in contact with all parts of the bottle's interior and cleaning it thoroughly.

The motor used to rotate the brush is of ¼-H.P. rating, and is equipped with an iron shield to protect the windings from moisture. Connection may be made with any lamp socket.

Peeling Machines.

Machines for peeling potatoes, &c., are not uncommon in this country, but we know of no pattern designed expressly for electric driving. We illustrate in fig. 12 an American type which operates

Fig. 12.—Vegetable Peeling Machine.

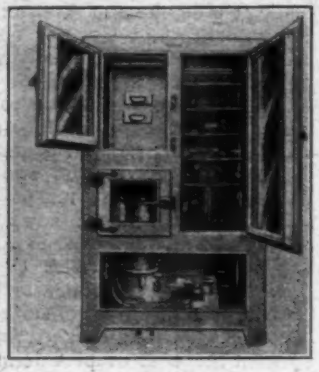

Fig. 13.—Iceless Electric Refrigerator.

on the cylinder and disk principle, both parts being concrete-lined by a special process. A stream of running water washes the vegetables clean during the peeling operation. The machine is equipped with an electrically-operated controlling instrument, which may be set so that the peeler will be operated only so long as is necessary to peel the vegetables it contains. The motor is fitted with a rawhide pinion, making the machine noiseless, and ball bearings. All the lubricating devices are centred at one point, and the entire mechanism is enclosed and shielded to eliminate any possibility of accident to the operator.

Refrigerators.

Of all domestic loads that the electrical engineer welcomes, there is hardly any more desirable than refrigeration. "Iceless refrigerators" are made by various U.S. firms, and one pattern is illustrated in fig. 13; this machine is of household size, self-contained, and automatically operated, and in addition to maintaining food at the proper temperature, it can make 150 small ice cubes for table use and special purposes.

A brine tank in the upper left-hand portion of the refrigerator is maintained at a temperature of approximately 15° F., and this promotes a rapid circulation and cooling of the air in the food compartments. The tank absorbs heat from the air, and in turn the expansion coils in the tank absorb the heat from the brine. Refrigeration is effected by sulphur dioxide, which is readily liquefied at room temperature and at low pressure. The liquid sulphur dioxide is evaporated in the expansion coils and is then sucked down by a pump into a condenser, where it is liquefied, and the process is repeated. The pump is driven by a ¼-H.P. electric motor. The temperature of the cabinet is maintained constant by an automatic controller, which starts the motor when the air temperature rises above normal and stops it when the temperature goes below normal.

Another type of refrigerator uses ethyl chloride instead of sulphur dioxide.

We have made no reference to electric cooking and heating apparatus or suction cleaners, because these are already familiar to British readers; we believe we are right in saying that of all such devices there is none which is more eagerly adopted by the housewife than the electric iron—when once it has been properly introduced to her notice—and many an elaborate electrical outfit traces its initiation to a trial given to an electric iron. It is really worth while to *give* an iron to every likely consumer. Another invaluable aid to the matron is the electrical sewing machine, of which examples have been illustrated in our columns. But space forbids further development of this subject, and we conclude by pointing out that our selection of items is far from exhausting the list of domestic electric appliances; there is hardly any household duty which cannot be lightened by the aid of electricity.

Birmingham.—New Plant.—Orders have been placed for two 15,000-kw. alternators and two sets of condensing plant for use at the Nechells, the total outlay incurred by the contracts, which have gone to Rugby and Glasgow, being £200,000. Formal approval by the Ministry of Munitions has to be obtained.

PRE-WAR AND PRESENT PRICES OF ELECTRICAL ENERGY.

As mentioned in our last issue, we have issued a table of "Pre-War and Post-War Prices Charged for Electrical Energy by 240 British Electricity Supply Undertakings," showing the various tariffs in force in the spring of 1914 and 1919, and the cost of coal at those periods. In previous years we have published more condensed lists of a similar nature; but having been invited by the Incorporated Municipal Electrical Association to repeat the inquiry, with some additions, we have found it necessary to embody the data in a separate sheet, which will, we believe, be found much more convenient for reference than our columns. The table does not profess to be exhaustive; the smaller undertakings have not been included, and returns have not come to hand in time from some of the larger ones; but as the main purpose of the table is rather to indicate the trend of tariff revision than to state the prices charged by each individual undertaking, we have not thought it necessary to wait for the last returns to come in. We hope that the data will prove useful to station managers, electricity committees, and supply companies generally.

Before commenting on the changes, let us congratulate the Aberdare Urban District Council and its engineer, Mr. A. J. Abraham, on the unique position of its undertaking; no change has been made in the tariffs for any supply, and the tramway fares have actually been reduced! This happy result is due to the fact that no coal is used; the station depends entirely upon the destruction of refuse for the generation of electricity. The next best record appears to be that of Runcorn and Widnes, supplied by the Mersey Power Co., Ltd. (Mr. G. W. Malcolm, engineer and manager); but here 95 per cent. of the output is sold under contract with the benefit of a coal clause. The North Wales Power and Traction Co. (water-power) has also maintained its average price—for power only—unchanged, though an addition of 6 per cent. has been authorised to cover the increased cost of labour.

The causes which have led to the general rise in price of electricity are, of course, only too familiar to most of our readers, and we will merely put on record that they are (1) increased cost of fuel, (2) increased cost of labour, (3) increased cost of materials, and (4) increased cost of management. Roughly speaking, coal and oil have gone up by 100 per cent.; in some cases the ratio is far greater, in others somewhat less—a strict comparison is not possible with the data available, because many stations which used smudge or slack in 1914 are using nuts or anthracite in 1919, or *vice versâ*. There is general agreement that the quality of the coal, of the same class, is far lower than five years ago, the ash content having increased from 10 per cent. to 25 or 35 per cent. Where crude oil was used exclusively in 1914, tar oil or a mixture of oils is used in some cases in 1919, again rendering comparisons misleading.

With regard to labour, the average increase in wages appears to have been about 120 or 125 per cent., and the same applies to the cost of materials. The cost of management has not increased at anything like the same ratio, though we know of no reason why the brains of an undertaking should always be the last to receive adequate remuneration; the management factor, however, is a small percentage of the cost of production.

Other expenses which have contributed to the advance in price are such as rates and taxes, increased repair costs due to overloading and overworking plant, and allowances to men on military service.

In the past the cost of a kilowatt-hour has been made up of capital charges approximating to 50 per cent., with coal, labour, &c., making up the other moiety. Now, the only items in the cost of production which have remained stationary during the war—apart from the small item of rent—are the interest and sinking fund payments in respect of capital expended before the war; the bulk of the capital charges. Nearly all other costs have advanced at least 100 per cent. It will be seen at once that the effect of the change in conditions has been to reduce the relative importance of the capital charges, and, in fact, the cost of electrical energy

has increased, generally speaking, by only 50 per cent. The price of gas, however, has doubled. Consequently, so far as pre-war installed plant and mains are concerned, the position of electricity supply undertakers has been *relatively* very much improved, although the actual price is higher than before the war. There is, indeed, no ground for reference to the "high price" of electricity nowadays; the value of money has fallen 50 per cent. or so, and if we divide all prices and costs by 2, we shall in effect restore pre-war values, when the fact will emerge that in reality, compared with commodities if not with currency, electrical energy has decreased in price by 25 per cent.

These figures are, of course, but rough approximations, but they may serve to correct erroneous impressions on this subject. The unfortunate feature of the matter is that the same cannot be said of conditions abroad, except in the case of European nations; hence, while we are not greatly prejudiced by the change in the value of currency within our borders, we are handicapped in competition with manufacturing nations which have not suffered a like change. So far as electrical energy is employed for the production of goods for export, its present "high price" places our industries at a disadvantage.

In scanning the table, it will at once be noticed that to determine the actual percentage increase in price with any close approximation to the truth is practically impossible; maximum demand tariffs and sliding scales can only be compared on the basis of the average prices received, which are not known. Only flat rates can be directly compared, and it is on this basis that we put the general increase for lighting supply at about 50 per cent.

We have not, so far, alluded to the change in the character of the load during the war; but it must be recognised that this exerted a very material influence on the cost and selling price. The demand for power in industrial districts—and in many districts which became industrial during, and because of, the war—increased enormously, to the great advantage of the load factor and output. The cooking load also developed, and the demand for heating apparatus greatly exceeded the supply; these loads also benefited the load factor and output. The policy adopted with regard to the prices charged for loads other than lighting varied widely in different places. Some managers simply added a fixed percentage to the accounts regardless of the nature of the load, and without altering the existing tariff; others added different percentages, according to the class of demand, whilst others devised entirely new tariffs. Hence it is difficult to institute comparisons or to draw general conclusions from the data. But one thing made itself markedly and painfully evident—that an extraordinary variety of systems of charging is in use by our electricity supply undertakings, and sometimes even by a single undertaking.

Of course, it is all due to the peculiarities of the supply industry—the lack of storage, the dependence upon load factor, and the heavy capital charges—and we do not impute blame to station managers on this score; it is somewhat strange, however, that out of the welter of sliding scales, maximum-demand systems, rateable-value tariffs, &c., no one or two systems have proved themselves pre-eminently adapted to the circumstances to the exclusion of others. It would be interesting to analyse the tariff systems embodied in the table, but this must be left to another occasion.

(To be concluded.)

Blackburn.—L.G.B. INQUIRY.—A L.G.B. inquiry has been held into the application of the Corporation to borrow £250,000 for the erection of a new generating station at Whitebirk. The town clerk said the suggested new site at Whitebirk consisted of 64 acres, on a lease of 999 years at a yearly rental of £480, with option of purchase at any time within the first 10 years. There were good transport facilities by railway and canal. Electrical reorganisation was at the root of the scheme which had been drawn up with the approval and sanction of the B. of T. There was no big electricity station in the district, and no possibility of Blackburn being supplied from any other source. The Corporation had applications for over 6,000 KW. for power purposes, the great bulk of which could not be touched at present.

COSTING IN RELATION TO EFFICIENCY.

By MAJOR E. A. PELLS, R.E.

ALTHOUGH standards are the foundation upon which all efficiency work rests, yet the importance of carefully allocated and kept costs cannot be accented too much as they constitute the pulse or indication of what is happening, and might very well be called control accounts, as it is only through these that a business can be efficiently controlled.

The correct allocation of costs is an important factor, and very difficult to procure, even where there is a skilled cost clerk available, for so much depends on the general organisation of the industry concerned. Costs must show "what really happened," not "what might have happened," and such costs well kept, show up every little inefficiency, thus enabling the efficiency engineer to locate and prevent a recurrence of such.

The costs of production should be kept quite distinct and always considered separately, as, for instance, the condition of the works is nothing to do with the cost of production, and any large sum spent on maintenance must not be allowed to creep into the production costs, as this charge affects the employer as a property owner rather than as a manufacturer, and if brought in, confuses the issue.

In careful production costing there is a bogey which it is always necessary to keep out, if one desires really useful results, and that is the method of allocating proportionate charges such as stores, transport, organisation, management, &c., by average or percentages, which are not based upon definite information. Unless an expenditure subserves in some way the efficient working of the machine or operation to which it is allocated, it is either incorrect allocation or wasted expenditure. Overhead charges on unemployed space and machinery show a condition which should not exist, and should therefore be shown separately as a measure of works inefficiency. This can be carried further, and the following could be considered as waste rates: Shop inefficiency, measured therefrom; idle machines; spoiled work; removals and rearrangements of plant, &c.; loss through stoppage by accidents, &c.; extra payment for overtime.

The use of the measure of inefficiency must act as an aid to efficiency, as it directs definite attention to things which if submerged in the general mass of costs, would often escape unnoticed.

On the other hand, production costs should include a direct ratio of overcharges carefully computed as follows:—

Land and building	Floor area occupied.
Power	Horse power used.
Light	Floor area occupied.
Heat	Floor area occupied.
Stores and transport	Bulk and length of time handling.
Organisation	Floor area or proportion.
Supervision	Bulk and length of time handling.

This will eliminate the averaging microbe from the costs, and each operation will, therefore, bear a correct burden instead of being often saddled with a heavy burden of cost which tends to favour the future or some other inefficient operation.

While one does not wish to get in any charges which should not be made or are inequitable, all up-to-date charges must be brought in to prevent "carrying forward," which favours present-day production at the expense of the future.

It is only the accumulation of carefully compiled records and the careful analysis of same that can enable those responsible to set up accurate standards; and when they are set up it is only careful records that can facilitate their useful application.

THE ELECTRICITY SUPPLY BILL.

(*Continued from page* 687.)

In view of the exceptional position which it occupies as the most important public body next to Parliament, and the purchasing authority for the company-owned electricity supply undertakings in the Metropolitan area, the attitude of the London County Council towards the Bill is of special interest. As shown below, the Parliamentary Committee welcomes its introduction, but seeks to retain to the Council its power to sanction loans, and to ensure that the Council shall have an influential voice, even if it does not take a predominant part, in the future of electricity supply in London. The Committee's recommendation that "special orders" should require the approval of both Houses of Parliament is redundant, for this is already provided for in the Bill. In common with other municipal authorities, the Committee wishes to see the terms of purchase that are offered to companies applied to local authorities also, and objects to the transfer of the powers under the Bill to the Transport Ministry, a proposal which seems to have no friends outside the Government.

The Finance Committee of the Stepney Borough Council understands that in transferring a public undertaking from one public body to another, no liability other than that outstanding at the date of transfer ought to be imposed upon the transferee, and also sees no substance in the fear expressed by some municipalities that the Bill will be used to establish companies to take over municipal undertakings; nevertheless, it endorses recommendations of the Electricity Supply Committee dealing with these points.

London County Council.

The report of the Parliamentary Commtitee, dated May 29th, on the Electricity (Supply) Bill, referring to past action by the L.C.C., points out that Acts passed in 1908 and 1910 transferred to the Council, subject to certain conditions, the powers of purchase previously vested in the several borough councils, so far as regards the undertakings of most of the London electricity supply companies, and empowered the Council to purchase the undertakings (or parts of undertakings) in the county of those bulk supply companies which were not previously purchasable by a local authority. The powers of purchase may be exercised in 1931, or at subsequent periods of ten years. The special powers of purchase possessed by the City Corporation and the Camberwell and Lambeth Metropolitan Borough Councils are preserved to those authorities until 1927 or 1928 as the case may be.

On November 10th, 1914, the Council decided to seek powers in 1915 for the establishment of a new electricity undertaking for London and certain adjoining districts. The principal feature of the Bill was the combination of public ownership, by means of a new authority to be known as the "London Electricity Authority," with company operation. It was necessary for the Council to proceed under the Borough Funds Act, 1872, but the necessary majority under that Act was not obtained to the resolution that the Council should confirm its decision to promote legislation, and the proposal therefore lapsed.

The Parliamentary Committee recommends: "That the Council welcomes the introduction of the Electricity Supply Bill, 1919, as forming a basis for a settlement of the question of the supply and distribution of electricity."

At the present time the Council is the sole authority for sanctioning loans to the Metropolitan borough councils, but there is an appeal to the Local Government Board. The Finance Committee considers that this position should be maintained, and the Parliamentary Committee recommends:—

"That in the opinion of the Council Clause 21 of the Bill, relating to the transfer to the Electricity Commissioners of powers with respect to the sanctioning of borrowing by local authorities under the Electric Lighting Acts, should be amended so as to enable the Council and other sanctioning authorities to retain their powers, but to require that in exercising such powers they shall act in consultation with the Electricity Commissioners."

With regard to the District Boards, the Committee recommends:—

"That in the opinion of the Council in cases where an elected public authority or authorities within the area of a district electricity board agree to assume financial responsibility, the representatives of such authority or authorities should consitute a majority of the Board, and that such authorities should be given the first option of assuming such responsibility."

"That in the opinion of the Council, the Council should have representation upon any district electricity board dealing with London, even if it should not assume any financial responsibility in connection with such board."

"That in the opinion of the Council special orders made by the Electricity Commissioners under Clause 5 of the Bill creating districts and constituting district electricity boards should be required to be approved by both Houses of Parliament before they can become operative."

Referring to the acquisition of existing generating stations and electricity supply undertakings, the report says the provisions are of great importance to local authorities, and also to the Council in view of the possibility of Greenwich generating station being acquired by a district board. It will be seen that local authorities will be compensated on the basis of outstanding debt, while companies will be compensated on the basis of cost, less depreciation. The compensation payable to local authorities may be increased only if a substantial part of the cost has been defrayed out of revenue. Most of the London undertakings have applied revenue to meet the cost of new works, but the amount relating to generating stations and main transmission lines is probably insignificant. On the other hand, a very considerable portion of the capital cost has been, by means of the sinking fund, paid out of revenue, but this provision is clearly not included. The object of excluding the value of renewals effected out of revenue is not clear, as the local authorities would appear to be entitled to some consideration under this head if they are only to receive the equivalent of the outstanding debt. If companies are to have the benefit of the present value (cost less depreciation) of their plant, it is difficult to justify different treatment to local authorities as regards past expenditure on renewals and replacements. In the interests of the consumers of the whole area it is of course desirable that the district board should be able to acquire the generating stations at the lowest possible cost, but the consumers and ratepayers of those districts which have made a provision out of revenue in excess of actual depreciation are entitled to some benefit from their past contributions, and it would seem reasonable that both undertakings should be treated on the same principle as regards the assessment of the compensation payable. The Committee recommends:—

That in the opinion of the Council, the standard price to be paid under clause 7 of the Bill in the case of a generating station or main transmission lines belonging to a local authority should be the same as that proposed to be paid in the case of a generating station or main transmission lines belonging to a company or person.

The Special Committee on Electricity Supply is strongly of opinion that local authorities should be given power to represent the interests of the small consumers before the Electricity Commissioners, so as to ensure that all the benefits arising from any reduction in price of electricity, resulting from the Bill, shall not go to the large consumers. The Special Committee has also suggested that the Electricity Commissioners should be enabled to give authority for the powers and duties of a District Board as to generation and supply of electricity to be exercised and performed, not merely through any authorised undertakers or through a company established for the purpose, but also through any local authority whether that authority is an authorised undertaker or not. It should also be made clear in the Bill that a District Board may lease a part and not necessarily the whole of its undertaking. The Parliamentary Committee recommends accordingly.

With regard to the transfer of the powers of the Board of Trade, the Committee states that it may be anticipated that the Ministry of Ways and Communications will be by far the largest consumer of electricity in the country, and its main concern, in connection with the supply of electricity, will naturally be directed towards meeting the special needs of railways and other means of transport. It is, however, generally recognised that an ample and cheap supply of electricity is of the utmost importance for the industrial welfare of the country. The Special Committee on Electricity Supply strongly urges that the Board of Trade should retain all its powers and duties under the intended Act, or that they should be transferred to some appropriate department which would be in a position to take a broader view than might be expected from a department which was specially interested in one phase of the question. The Parliamentary Committee concurs in that view, and recommends:—

"That in the opinion of the Council, the powers and duties of the Board of Trade referred to in Clause 44 of the Bill should not be transferred to the proposed Ministry of Ways and Communications."

Stepney Borough Council.

The Finance and Parliamentary Committee, commenting on a reference from the Electricity Supply Committee, points out that the basis of compensation to local authorities and to companies respectively contained in the Bill, where generating stations and "main transmission lines" have been transferred to District Electricity Boards, are in accord with the findings of the committee appointed by the Board of Trade, which was composed of some of the greatest experts in the electrical profession, the reason for the differentiation being, presumably, that local authorities having become undertakers for electrical supplies in the *public* interests and not constituted for *profit sharing* purposes, no liability, beyond that devolving upon local authorities at the date of

transfer, should devolve upon the District Electricity Boards, which are also to be public bodies working for the public good in an endeavour to supply "a cheap and abundant supply of electricity."

Further, the Finance Committee does not think that it is the intention of the Government, particularly at this time, when the principle of "nationalism" is being so strongly advocated, to use a district board as a conduit for transferring a municipal electricity undertaking to a private company, but agrees that the point should be made clear by express words being inserted in the Bill prohibiting any such transfer. The Committee approves of the recommendations of the Electricity Supply Committee, which provide that the Council be recommended to request the local Members of Parliament to endeavour to secure an amendment of the Bill in order to place the local authorities, the companies, and persons affected by the Bill upon the same basis as regards standard price; that all generating stations should—good or bad— be taken over, with the exception of stations where the generation is trivial in amount or where the undertaking is so situated as not to lend itself to a general scheme; and that, as, under Clause 16, it would be competent for the powers and duties as to the generation and supply of electricity, instead of being exercised and performed by a District Electricity Board, to be (*inter alia*) carried out through a company established for the purpose, and as it would obviously be unfair that a municipal undertaking built up upon the credit of the ratepayers and managed in its development by representatives of the ratepayers, should be leased to a company, the Council be recommended to call the attention of the local Members of Parliament to the matter with a view to the amendment of the Bill to prevent such a contingency occurring.

(*To be continued.*)

THE STILL ENGINE.

THE advantages of the internal-combustion over the steam engine in certain directions are admitted, and yet, in spite of the growing fuel costs, the former type of engine fails to eliminate the latter, and for large powers fails even to keep up with it. The reasons for this state of affairs are also common knowledge, and we now come to the juncture where the bad points, if they can be so called, of each form of engine are improved and used to advantage by the other.

We had the pleasure of being present at a most interesting and instructive demonstration last week, at the Engine Development Co.'s laboratory, at Chiswick, when an opportunity was given of inspecting and seeing those Still engines running, on which were obtained the results given in Capt. F. E. D. Acland's recent paper before the Royal Society of Arts. Remarkable economies are claimed for these engines, and they are certainly capable of very surprising performances. We saw a 3-cylinder engine running on petrol, which was built in 1910, and still apparently as good as ever. It was rated at 15 H.P., but actually when overloaded it has developed 35 H.P. quite comfortably. A larger single-cylinder engine which was also run under varying conditions put up a no less creditable performance. The cylinder dimensions of this engine are 13.5 in. diam. by 10 plus 12 or 22 in. stroke, with a brake thermal efficiency of, it is claimed, 42 per cent. It is rated at 360 B.H.P. at 360 R.P.M., and on overload has comfortably developed 540 H.P. These engines will run on both light and heavy oils, there may be more than one of the combined cylinders, and part of the steam may be used in separate cylinders, compounded or otherwise. An impressive feature is the ease with which such engines may be manœuvred; the power can be varied from zero up to overload, and the steadiness with which they run under varying conditions is remarkable. The highest efficiency claimed for the Still engine, namely, 41 per cent. brake efficiency, is the total efficiency without any added steam. With regard to sizes, cylinders up to 22 in. have been built at the present time, and Mr. Still is confident that no trouble is to be expected with sizes varying from 4 in. upwards. The latter size is being considered in connection with tractors and road vehicles. In the Still engine the final exhaust temperature is stated to be as low as 150 deg. F., so that the working temperature range is very large. Efficiency is improved by the high jacket temperature resulting in a higher mean temperature than usual in the combustion stroke. All heat rejected to the jacket is recovered directly as steam, and the steam cylinder, it is claimed, gives unusually good results, since as it is preheated by the combustion stroke, there is no condensation. It is claimed that the compression pressure may be reduced by 50 per cent. with entirely reliable ignition, due to the higher mean temperature of the cylinder, and this simplifies constructional difficulties. From the operating point of view, the steam warms the engine before starting, and there are, therefore, no sudden temperature changes, and it allows the engine to be started against load.

These are the main considerations on which arguments for economy are based. The engine is certainly an extremely interesting one, and it is to be hoped that it will be developed and become of importance; since it would appear that it has already demonstrated its practicability.

The following abstract of the discussion on Capt. Frank E. D. Acland's paper,* on the principles of the Still engine, read before the Royal Society of Arts, is taken from the *Journal* of that society.

Sir DUGALD CLERK, K.B.E., F.R.S., explained that he had had the pleasure two years ago of inspecting the engines in question. Many experiments had been made on the variation of compression volume—compression space—and the limit seemed to have been approached. Above a compression ratio of 20 the curve became very flat, and practically no further good could be obtained by increasing it above that figure. In an ordinary-designed internal-combustion engine, it was always found that with properly designed valves and a properly designed combustion space with a minimum port surface, it could be reckoned on getting 0.7 of the air standard efficiency in indicated power; or with an engine with about 20 range of compression an actual indicated efficiency of about 49 per cent. could be obtained. After going into the past history of gas engines, the speaker said he doubted whether an engine of the type shown by the author on the screen, with the long sleeve and the clearances that there must be there could be expected to give efficiencies approaching 20 per cent. additional. Was the highest efficiency the author claimed for the Still engine (about 41 per cent. brake efficiency) the total efficiency without any added steam? In addition to the thermal question, there was the practical one of the locomotive. A compound steam and internal-combustion engine would be a very handy piece of apparatus, and there were certain advantages to be gained, no doubt, from the heating of the cylinder. He did not think it could be said, from the author's experiments, that the mechanical stresses, due to the heat flow, were really reduced. The mechanical stresses found in the internal-combustion engine, within the cylinder, combustion space and piston, were not those due to the difference of temperature between the cold water jacket and the hot water outlet. They were due to the cyclic change within the cylinder, because at one instant there was a flame playing on a piece of metal with a temperature of nearly 2,000 deg. C., and the next instant there was part of the cold air playing on the same plate of metal. The consequence was, there were obtained expansion stresses which had nothing to do with the water jacket system at all.

Prof. W. H. WATKINSON remarked that he had had the pleasure, about a year ago, of seeing one of the engines at work at Chiswick, when he had been very greatly impressed by the ease with which it could be manœuvred. Its power could be varied from zero up to an overload within a few seconds. Regarding the possible destruction, or reduction at any rate, of the vacuum due to leakage past the piston, leakage sooner of later would occur, and that, with the arrangement shown must involve a great reduction of vacuum and a greatly increased amount of the work to be done by the air pump. As to whether steam cooling would suffice for much larger cylinders than those which had been experimented with, the speaker's impression was that steam cooling would not suffice, and he believed that it would be well that that arrangement of steam cooling, steam on one side of the piston and internal combustion on the other side, should be departed from, and that the steam should be used in, say, the uni-flow type of engine, or in one of the Parsons steam turbines. In either of those ways, a more practical engine for big scale work could be obtained. He should have anticipated that, owing to the heating of the charge during its admission and compression by the heat transmitted from the hot water in the jacket, preignition would inevitably have occurred both with gas and petrol engines. He thought that would be the case if fairly large engines were used. It was exceedingly difficult to accept the author's figure for oil consumption of .302 lb. per shaft H.P.-hour. It might be a snap result, but he thought it was too good to be obtained in regular working over several hours. If it was, even in spite of the great complexity of the engine, there must be a very great future for it.

Prof. C. VERNON BOYS, F.R.S., said he had been privileged some years ago to conduct some tests on the engine as Mr. Still had been developing it from the beginning, and he should like to say how he had been struck with the perfectly scientific manner in which Mr. Still had arranged the series of tests with a view to the determination one at a time of the value of each individual step. These tests showed conclusively the value of the Still combination. The steam on the one side of the piston enabled the explosion operation to do better than it did previously. The explosion operations put the steam into a position not found in any engine before, and instead of having condensation, loss, waste, and all the things that went to damage the perfection of the steam engine, the steam picked up heat and did better than it could even in a theoretical engine. He would like to correct a misapprehension which he thought Sir Dugald Clerk was under with regard to the stresses set up due to the thermal differences in the engine. He (the speaker) thought that in the Still type of cylinder the mechanical stresses set up were less, because the thickness of the wall space between the hot gases inside the cylinder and the circulating water was not the thickness of a cylinder which was strong enough to carry the pressure; it was a relatively thin casting between the inner wall of the cylinder and the series of water spaces,

* ELEC. REV., May 30th, 1919, p. 643.

and that did not take the explosion stress which was borne by a jacket outside it. So that stresses set up in the cylinder by the gradient of temperature between the interior and the exterior were taking place in metal which was of a form more able to withstand them, because at least it was free from the bursting strain of an ordinary cylinder, and there was less stress to withstand. In conclusion, he referred to the present universal panacea of world-wide electrification. Surely there was too much being promised about universal electrification, and a paper of the sort read that afternoon might go a long way towards an appreciation of what was possible.

Mr. J. B. Stokes said the Electricity (Supply) Bill was before Parliament, and the question he would put, not to the author, but to the audience was: Were they sufficiently interested, and was their faith in the engine such that they considered it worth while continuing further research work on a large scale? If they thought that, then he would urge them to do what he had done that morning. He had gone to the Houses of Parliament, had met his representative, and had asked him whether he was prepared to back up a full inquiry being made into all types of prime movers before the Government finally settled upon the best one to adopt. He thought the audience should get their representatives to do the same. He thought that locomotive work was the line along which the first great development would lie. With regard to designing the particular engine under discussion with larger pistons, there were ways of getting over that trouble besides going in for larger pistons—namely, by multiplying the number of pistons. For instance, some aeroplane engines had about 36 cylinders. At any rate, 12 cylinders of 22 in. by 36 in., could be utilised quite well. In locomotive work there was already a size of cylinder which was suitable for the type of engine mentioned, and he would suggest that, to enable the locomotive to start readily from any point, arrangements might be made by which steam could be admitted, not only to the regular steam ends, but also to the combustion space.

Mr. Frank Bailey understood that the size of the generators must necessarily be governed by the limitations of the system so far as the size of the cylinder was concerned, and therefore power above a certain limit could only be obtained by increasing the number of cylinders, and the number of lines of moving parts. He did not say that was a disadvantage for a moderate output, but, so far as electricity supply was concerned, it opened an interesting feature. It was not now a question of the engine being in competition with the steam turbine, so much as it might affect the demand on the electrical power works by the ability of power users to utilise a more efficient generator. If the load factor was to be materially influenced in the future by the development of a better type of prime mover, clearly it would pay many users, who were now glad to use the electric motors, to put in power units of a limited size but sufficient for their own supply. He thought in that way the paper had a very vital bearing on the matter, especially in developing small generating works in those areas which would otherwise require costly transmission mains from a distant source.

Mr. F. Leigh Martineau said it might be of interest to see figures which would result from what might be called the "De-Stilling" of the best Diesel engine. If the same type of engine was converted or rebuilt, so as to adopt the Still principles, the following results would be obtained. The indicated thermal efficiency was 47½ per cent., and the brake thermal efficiency was 36 per cent., so that there was a friction loss of 11½ per cent. The total waste heat was 52½ per cent. The radiation loss would be about 2½ per cent., and the stack loss 8 per cent.; so that the waste heat available as steam, which gave a boiler efficiency of 80 per cent., would be 42 per cent. Using compound on the steam side with the superheating during expansion, there was no reason why there should not be 20 per cent. available from the actual steam used in the cylinder as indicated power. Therefore 8.4 per cent. would be added in efficiency to the 36 per cent., which would increase the brake thermal efficiency up to 44.4 per cent., and the indicated thermal efficiency up to 55.9 per cent., or an increase of efficiency of 23½ per cent. on the brake. These figures did not take into consideration one or two small gains which actually occurred in practice. No decrease of friction was allowed for, and the friction of a Still engine was always less than that of a normal engine of the same size. Again, certain other friction losses, although present in the engine, actually gave back a certain percentage of their friction heat as steam. For instance, piston-ring friction created steam in the jacket, or helped to do so.

Mr. W. J. Still, dealing with lubrication, said he had gone into a long series of experiments on that point, and had found that if the temperature rose to about 450 deg. F. difficulties began; but below that point perfectly good lubrication was obtained under very heavy loads in the cylinder with a mixture of heavy cylinder oil and graphite. His experiments with the engines when they were built had substantiated that position. He had never had any trouble whatever in regard to lubrication. In fact, he was using much less lubrication than was used on ordinary combustion engines. A set of trials made for a certain Government, gave a consumption of lubricant equal to 1.4 per cent. of the amount of fuel oil used in the combustion cylinder. Better results even than that had been obtained, but that result had been obtained over long trials at three-quarter load, which was not, of course, the most efficient condition so far as lubrication was concerned. During that trial the engine's mechanical efficiency was 87 per cent., and after the run the engine was examined very carefully, and the surfaces were found to be in absolutely good condition. As to "complexity," it should be borne in mind that the engine is not a prime mover with parts added to it, but two prime movers both earning dividends. With regard to complication, each application of the engine must be dealt with separately; but, considering one type only, viz., large marine Diesel installations, these would be found usually to contain more parts, and those of a more troublesome character, than were essential to a Still engine equipment. Large Diesel engines were often constructed with piston rods and crossheads, in order to obtain better running conditions, and all Diesels were fitted with air-starting valves. The latter were equivalent to the steam valves of a Still engine, so that the only added gear the engine contained was a cover and stuffing box for each cylinder; these were not moving parts, and a well-known firm of Diesel engine builders fitted its engines with these parts merely to avoid chilling the combustion chamber with compressed air when manœuvring. The large business carried on by this firm indicated that the added parts justified their existence although their use was momentary and they added no power to the engine equipment. With regard to auxiliaries, the boiler, burner, and feed pump were usually to be found installed with Diesel engines merely for cooking and heating purposes, these engines also required at least one set of large auxiliary engines attached to air compressors of equal power, and were often fitted with two such sets. In addition, they required compressed air receivers and cooling water pumps, with, in recent systems, a water-cooling element (practically a condenser), and a circulating pump. From the foregoing, many large Diesel installations contained far more parts than those necessary for a Still engine, and even the simplest of them were more complicated. Most of the Diesel auxiliaries consisted of very fine high-class machinery, which required far more attention and upkeep than steam auxiliaries; the functions they fulfilled were non-remunerative, and the fuel consumed in them when "standing by" was wasted. In respect to comparisons of thermal efficiencies these should be confined to such engines as were of similar size, and working on like cycles; the 41 per cent. quoted was obtained from a high-speed Still engine operating on a two-stroke cycle, and was not properly comparable with the engine tested by Mr. Mathot, which was a slow-speed engine working on a four-stroke cycle. This Still engine gave in normal service four times the output per square foot of cylinder cross section obtained from that particular Diesel; it must not therefore be expected also to add 25 per cent. to the heat efficiency of that exceptionally efficient engine. That it did add 14 per cent. was sufficiently remarkable. If this high-speed, two-stroke engine was compared with Diesels of a similar class, such as the Nobel Diesel, it would be seen that although it gave twice the output per cylinder cross-section, it also added 38 per cent. to the thermal efficiency of that engine as tested at full power, and 27 per cent. to its best efficiency; at the latter load the Nobel gave less than one-third of the relative power output of the Still engine.

The Chairman (Sir C. A. Parsons) agreed that in a system with a large number of gas engines he would rather take the combined steam direct into the turbine, if a turbine was to be used. One wanted the highest possible vacuum, and one high-pressure cylinder with a reciprocated piston would admit gas to the steam side and that would partly vitiate the vacuum; so he thought in a large system he would prefer to keep the steam entirely separate from the gas. But for engines of moderate size it made a very convenient unit, and was much simpler than the separate steam engine. Before the war, designs had been got out to apply combustion engines to a cruiser of 30,000 H.P., and it had worked out to 150 cylinders all geared on to four screw shafts. They covered nearly the whole bottom of the ship. The only way to get a large power on to an alternator or dynamo was to gear a number of internal-combustion engines through frictional spring couplings, on to, say, one reasonably large sized generator. One got a cheaper and more reliable engine by keeping the size of the unit small, and also a less total weight. He looked forward to a great future for the gas-steam engine for locomotive work, especially in waterless districts, like Australia, where there ought to be a very great future for it.

Capt. F. E. D. Acland, in view of the lateness of the hour, communicated his reply in writing, as follows: Engines with high compression ratios remained ideal like their efficiencies. The Still cycle was quite logical in that it dealt with the lower limit of the temperature scale and increased the brake efficiency in a practical manner. The percentage of heat passing to the cylinder walls and pistons was found to be less than in normal engines, and the cooling of larger pistons could therefore be carried out successfully with the quantity of steam available. To use the steam in turbines or external engines was possible, but implied loss of efficiency, both in the combustion and steam cycles. Details which depended on the specific application of the system had been avoided as much as possible in the paper whose object was to submit for examination and discussion the principles of a new prime mover. The best consumption of .302 lb. per B.H.P.-hour was over an observed period of one hour after the engine had been run continuously to obtain steady conditions. The special construction adopted with a view to meeting the anticipated difficulty of maintaining an efficient vacuum had proved effective. Mr. Still submitted the whole of the basic

principles on which he intended to work to Prof. C. Vernon Boys, F.R.S., in 1909.

Lieut.-Col. D. J. SMITH (communicated) said that so far, for high powers, the steam turbine had things all its own way, but it was doubtful if this could continue if the promise of the Still engine was fully borne out, and it would not be remarkable if in marine practice a return was made to reciprocating machinery for large powers. That this seemed very probable was due to the great improvements recently made in gas producers. Gas producers would make an almost ideal combination with the Still engine, and would furnish power at a fuel expenditure hitherto considered impossible. The high cost of fuel was a great handicap to the most easily handled and controlled form of power they had—electricity. The extreme advantages possessed by electricity were such that they almost counterbalanced high cost; but if it was possible, as it appeared to be, to generate electricity by the Still engine and improved gas producers at a much lower cost than was now possible, it would give an enormous impetus to electrical development in every direction. Even after spending millions in building vast central stations, it was only expected to reduce coal consumption per H.P. to 1.5 lb. As this figure could be greatly improved upon now in any small generating plant using a good gas engine, it was hard to see where the coal conservation came in. If they are to be forced to use electricity in order to justify enormous State controlled electrical generating stations, it was to be hoped that the Still engine would be fully investigated before the plant was ordered, as there existed now millions of tons of so-called waste fuel which could be successfully used n certain new gas producers, and, in conjunction with the Still engine, would use the nation's resources to far greater advantage.

THE INSTITUTION OF ELECTRICAL ENGINEERS.

THE visit of the Scottish Centre of the Institution of Electrical Engineers to Aberdeen, on June 6th, was favoured with delightful weather. The day's programme opened with a visit to the Fish Market at 8 a.m., and later between 70 and 80 ladies and gentlemen were present at the Town Hall when Lord Provost Sir James Taggart gave the Centre a civic welcome. This was acknowledged by Mr. J. F. Neilson, Glasgow, chairman of the Centre, who also emphasised the importance of the formation of an Aberdeen Sub-centre of the Institution.

Mr. C. H. Wordingham, president, in the course of a short address, said that no question of any importance in the industry had emerged which had not been taken up by the Institution. Alluding to the Electricity Supply Bill, he said they were now at the most critical point in the history of the supply industry. For some reason the electrical industry had an extraordinary fascination for the legislator. In the past, legislation had been wholly evil, but some thought that they wanted more legislation. It was a very dangerous experiment to put any industry largely under Government. They were in for legislation, and they would have to make the best of it. He spoke of the value of the Institution in improving professional and industrial relations with foreign countries, allied, and neutral.

Prof. Maclean, Glasgow, delivered a lecture on "Water Power." He said he was concerned with it not merely as an industrial proposition, but as a means of elevating the national life, of restoring its man power, of relieving the congestion in the large centres, of resettling the people on the land, and of furnishing them with better houses, better food and clothing, better religious and educational influences, and a more natural life in the country. Agriculture and afforestation alone would not bring a happy and contented population in the Highlands. A little industry here and there to supplement the local activities and at the same time utilise more fully the local resources was what was needed. For that purpose water power was immediately available, and was so distributed by nature that there need be no congestion as in the large centres, but it might be easily portioned out to serve large areas. Elsewhere than in the North they might have their own railways and machinery worked by a more simple and, in the Highlands at least, more readily available natural resource. In spite of the invention of the electric motor and the development in electrical transmission over long distances, water power was less used in the Highlands to-day than it was a century ago.

He quoted a paper by Mr. A. Newlands on the subject, and also the recent interim report by the Government Committee dealing with nine possible water power schemes in the Highlands, capable of giving 183,500 continuous E.H.P., transmitting electrical energy to Glasgow, the Clyde Valley, Edinburgh and district, Aberdeen, and Dundee, and capable of delivering at least 1,000 million B.T.U. per annum within a radius of supply of from 80 to 85 miles. Taking the efficiency of transmission as 80 per cent., and the number of B.T.U. per ton of coal as 650, this would mean a saving of coal of 1.85 million tons of coal per annum. In the Highlands, besides other purposes, the power might be used for sawmilling, mealmilling, for laundry work and dye works, as well as for the making of yarn and woollen and tweed [illegible]. The cost of the scheme was estimated at £7,075,000. [illegible] enterprises during construction would afford employment [illegible] thousands of men, probably 6,000 alone being needed for t[illegible] at Lochs Ericht, Rannoch, &c. Most of the schemes would originate in Inverness-shire, and there as elsewhere the decrease of population would be staunched.

The Committee on Water Power Resources said there had been strong evidence regarding the lack of adequate training facilities in the universities and technical institutes for young engineers wishing to enter the field of hydroelectric development. Universities and institutions were prepared to participate in the fullest possible manner in the training, and it was not fair to expect that the moment the country had become alive to the value of water power the colleges should be ready with complete equipment and staff to help in the work. The college with which he was associated had hitherto had scant encouragement to develop that side of its work, but had a select course for the young engineer wishing to enter that field, and the number of students engaged on works abroad, particularly in Canada, showed that the subject had not been entirely neglected.

Mr. Newlands, chief engineer, Highland Railway Co., said the views expressed were very largely and universally held by the Highlander. There was undoubtedly a very strong determination on his part to secure such an amount of power as existed for his own particular need. If the Highlands were simply to be looked upon as the power-house for the South, he would be up in arms. There were many sources of social and economic development which in themselves were not essentially dividend-paying concerns. They paid indirectly in the value they were to the State as a whole, and if these powers created a settlement of the population, it seemed to him the question whether they were to pay fat dividends or not did not enter very largely into the solution of the problem.

While the members of the Institution were holding their meeting, their lady friends made a tour of the city in the Suburban Tramway Co.'s 'buses, visiting Duthie Park and the West-End.

At noon the members visited Marischal College and later the Art Gallery.

An hour later a company of about 100 were entertained at lunch in the Grand Hotel by the Electricity Committee. Lord Provost Sir James Taggart presided.

The Lord Provost gave "The King," and then "The Institution of Electrical Engineers," whose growth and increasing influence he commented on.

In reply, Mr. Wordingham said Aberdeen had been a revelation to those who had never seen it before. They were to have legislation with far-reaching effects on the industry, and every town which had embarked on electrical supply had a vital interest in the Bill, which should be closely scrutinised.

The toast of "Bon-Accord" concluded the proceedings, and the party went off to visit Rubislaw Quarries, Donside Paper Mills, Old Aberdeen to see Oldmachar Cathedral and King's College, and the electricity works, where tea was served.

Mr. Archibald Page, assistant manager, Clyde Valley Power Co., expressed great pleasure with the afternoon's entertainment. He proposed a hearty vote of thanks to Councillor Gibb and to Mr. Bell and his staff, which were given.

We are indebted to the *Aberdeen Journal* and the *Aberdeen Free Press* for material upon which the above report is based.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Mr. Wordingham's Address to the I.E.E. Territorial Centres.

I wish, as a member of the E.T.U., to take this opportunity to record my opinion of Mr. Wordingham's address to the territorial centres of the I.E.E. I can imagine many members of the Institution immediately bristling with rising ire and outraged dignity at the idea of a mere plebeian of the electrical industry daring to criticise anything originating from such a superior and infallible source. Personally, I feel impelled to this course, through the attitude of Mr. Wordingham (in so far as it affects my interests) upon the question of the organisation of power station engineers, the Government's attitude towards industries (arising from the Whitley Report), and, finally, the intention to apply for a Royal Charter. I take the following extracts from the address, as published in the *Journal of the I.E.E.* for the month of April, and *not* from *your* condensed and palatable version which is appearing periodically in the REVIEW. It says: "Towards the end of last year the Council were informed that very strenuous efforts were being made by the Electrical Trades Union to bring within its membership not only workmen but engineers of all ranks up to and including chief engineers of central stations. . . ." That was intolerable. "The Government have compelled us to organise." "They (the Government) will not deal with individuals." "The

Whitley Report recognises only two classes: workmen and employers." "The brains are left out altogether." The address further continues to recommend the E.P.E.A. as a suitable *trade union*, and says: "The trade union idea was a very little pill for most of us to swallow. . . . Some of us have more or less choked over it; but it has had to be swallowed." Now that class of man the E.T.U. is endeavouring to bring within its ranks (and who Mr. Wordingham is strenuously aiming to retain) has undoubtedly been sadly disturbed, during (and as a result of) the war. Usually a member of the middle class, he, and his fellows in their youth, have provided a splendid field for the employers to exploit (at the expense of the working-class youth), and eventually, as regards status, he evolves into an individual half-way between the employer and the worker. At present the workman, in the matter of wages and conditions, is in a superior position, due entirely to the fact that he has paid, organised, and fought for these advantages, and, further, he has forced an unwilling Government to accept the fact that in industrial matters there *are* only two sides. (In passing, I would like to say that this was an equally bitter pill for the Government to swallow, and it is on record that *they* choked over it, more or less.) Now the position at present is that, owing to force of circumstances, the "brains" (as per Mr. Wordingham) can no longer remain a "buffer class" in industrial matters. Keeping in mind that they *are* workers, they have two paths open to them. The first is Mr. Wordingham's scheme (as unfolded in his Address) to join the E.P.E.A., when they will be represented on the proposed Grand Council of the I.E.E., and will complacently sit with such philanthropists as the E.C.A., I.M.E.A., and the I.A.E.P.C., &c., in fact he will become a modern Daniel. The second is *my* hideous suggestion; that is, that as a worker and an employé, he throw in his lot with the workman and join those "brainless" station-engineer branches of the E.T.U. I will not labour the second alternative, because 99 per cent. of the brains will fall in with the former scheme. It will appeal to them from the point of view of their *infra dig.* and class-consciousness. It is an unenviable truth that the English middle-class (which comprises the so-called "professional brains") is the possessor of the majority of that unutterable human entity known in common parlance as the snob. Further, I submit that the sentiment most apparent in this extract is an earnest attempt to bolster up this snobbery for fear some members of the "technical brains" should so far forget themselves as to embrace the (so-called) revolutionary methods of the workers. I think Mr. Wordingham is to be congratulated on this exhibition of class-rancour, and the Institution should be proud of this new preacher of class-war. Reading further, I find Mr. Wordingham exchanges the whip for the "lollipop" with reference to the E.T.U. "After all, what we have to fight is a common enemy. With regard to the E.T.U., we do not even want to fight them." I would draw the attention of the "technical brains" to the former phrase in this extract, as it is addressed to them. I would also ask them to analyse Mr. Wordingham's projected scheme, and I think they should agree (from the point of view of their interests) that they will be in the position of the ostrich with its head buried in the sand when they find themselves sitting on that Grand Council with *their* "common enemy." I hardly think that responsible members of the E.T.U. will be under any illusion as regards the attitude to be adopted towards Mr. Wordingham and his ideals. *We* know them from experience, and I think every trade unionist has food for thought when he thinks of the mental indigestion Mr. Wordingham and his colleagues suffered when they had to swallow that trade union pill. With reference to the intention to apply for a Royal Charter, &c., it is only natural from the class tone of the Address that in the intention to consolidate professional class interests that relic of feudalism—the Royal Charter—should be invoked. It is the duty of all workers in the electrical industry to watch this move whereby a pampered minority will very deliberately "pick the best plums for themselves" under the direct patronage of the Crown. I would venture to say as a worker and a member of the E.T.U., that, of the many effusions of Mr. Wordingham, this address is the most revolting and nauseous exhibition of "class *versus* class" that we have had the privilege of reading. My earnest sympathy is extended to those unfortunates who will swallow this bait so temptingly held out to them by the President of the I.E.E. In conclusion, I would reiterate the fact (for their benefit) that there *are* only two sides to industrial questions, and that no matter how much they may pride themselves as to the possession of superior "brains" it is to their benefit to be organised with the workers.

M. Boyle, E.T.U.

Newcastle-upon-Tyne,
June 15th, 1919.

The E.P.E.A. Award.

Like "rare and refreshing fruit" in this hot weather comes the laboriously facetious letter of "Connaught T. Smith." Such a delicious sense of humour is simply priceless, and must go far to sustain the drooping spirits of the author what time the payment of the award tarrieth.

Who, regarding the tone of his former effusions, would have credited him with the possession of a dual personality? The forbidding Mr. Hyde of the past few weeks has metamorphosed into the genial Dr. Jekyll of to-day, whom the heady vintage of his exuberant high spirits has inspired to the giddy jazz with which he has just occupied so much valuable space in your columns. His concluding remarks, however, seem to point to its being a valedictory address, for which relief much thanks!

When I rashly ventured to use metaphor to illustrate my points, I confess I did not envisage all the possible results that might follow the reckless unsheathing of the lethal weapon which has afforded Mr. Smith so much hilarity. He desires to *use* the sword—so much was already obvious from his previous letters—but the usual preliminary to doing so is to release it from its scabbard, the cutting edge of the latter being less efficient than that of the naked blade. To "strongly draw," the expression to which Mr. Smith takes exception, and which, by the way, is not of my invention, but is a quotation from a very famous piece of literature, implies that the drawer is strong, has a strong cause, and is prepared to use his weapon strongly and resolutely until his purpose is effected; moreover, the mere demonstration of potential force has been known to prove quite successful in bringing an enemy to reason without proceeding to extremities, provided the will to make good the threat is present and recognised, so that Mr. Smith's humorous dissertation loses its point, while the sword does not.

As to charming the kernel out of a nut by moral suasion, such an absurd suggestion was never made. As long as moral suasion is effective in securing a desired end (this, observe, has nothing to do with nuts) as it often is in spite of the scorn poured on the idea, it is foolish to adopt hostile measures. These should only be employed when all other legitimate means of obtaining justice have proved futile. The tone of Mr. Smith's previous outpourings gave the impression that he had no use for anything but drastic action, first, last, and all the time.

Your correspondent stigmatises the statement that "a very considerable percentage of E.P.E.A. members have received the award" as incorrect, and cites in support of his contention the latest report of the Association. In his haste to ridicule my metaphor it has evidently escaped his observation that "members" and "undertakings" are not synonymous. Even a few undertakings may employ a large number of members, and conversely.

With "Connaught T. Smith's" grievance, and that of many other members of the Association, I can sympathise, but, as I have already said, to sneer and gird through the columns of the Press at the only organisation with the power of redress is to crab its usefulness, and to weaken the hand on which we depend, when necessary, to "strongly draw" the sword.

Shift Engineer.

June 14th, 1919.

Further to correspondence on the above, I think you will quite agree, Mr. Editor, that Mr. Connaught T. Smith and myself have done our best through your columns to get at the truth about this award. Up to now we have been unsuccessful. Will not the secretary of the association give us a straight answer? Is the award backed by any authority? And what is the remedy to a point-blank refusal by the committee to accede to the award? Your correspondent "Wessex" has misconstrued my letter of May 6th. Many of us have refrained from joining up till now, as anyone in outlying districts will realise the difficulty however much one is in sympathy with the movement. I sincerely hope I shall become a member of either or both unions, but am afraid I shall be ineligible for the E.T.U.

Regarding wages being *dangerously near* your own, I know cases where they are *above*, more by good luck than ability, and where far less hours are worked, and no responsibility. I quite agree that competent labour should be well paid, but where the price for the "duds" is the same I cannot agree with E.T.U. methods.

I can assure Mr. Connaught T. Smith that I have met, conversed, and shaken hands with, these elusive supermen, who have received the award, but they belong to the super-stations, and having got it, I am sorry to say, they prefer to lie low. To go further, I will cite a case to committeemen, directors, and a very few chiefs: A large Corporation undertaking was severely criticised recently (and it required it) not very far from here. The whole staff joined the E.P.E.A. with disappointing results, in fact no result, month after month; in desperation they joined the E.T.U. What happened? With the backing behind them of practically the whole of the men, both inside and out, they immediately received the grant which they had been trying to get through the E.P.E.A. for months and months. There is no need to ask why! and comment is unnecessary. "Change over" puts the matter very neatly.

I cannot agree with "Shift Engineer" (I do wish your correspondents would put their names, surely there is no need for camouflage). I saw page 648 ELECTRICAL REVIEW; very nice! But instead of the association worrying over power Bills, let it get the award applied to its members. I will never believe "Bolshevik" a term applicable to any Britisher; a deal more publicity to the whole affair is what is required, and Mr. Connaught T. Smith's criticisms are justly deserved. What about a new association, the C.E.E.A.

(Chief Electrical Engineers' Association) as an offshoot to the E.P.E.A. and E.T.U. I have heard of a very good man who might take the secretaryship.

H. A. Harding.

Bognor Electricity Works,
June 11th, 1919.

Working Speeds in Radio-Telegraphy.

In your issue of the 6th inst., under the heading of "Working Speeds in Radio-Telegraphy," Mr. E. Raymond-Barker asks for some information in the interests of the telegraphing public, which I have pleasure in supplying.

The delays complained about in respect of the Madrid-London service were mainly due to the strike of the telegraph staff of the land lines in Spain, which resulted in a great accumulation of messages in the telegraph stations throughout that country.

The wireless stations, however, would have been able to cope with that accumulation if modern installations had been available, but the stations which are at present serving are old, and were not constructed for a commercial telegraph service between the two countries, and they are only being used temporarily pending the construction of up-to-date and efficient stations for this work.

The wireless stations which have been erected to conduct a commercial service which I had in mind, and to which reference is made, have been devoted to war purposes ever since they were constructed, and have not yet been completely released.

The wireless service has, nevertheless, greatly relieved the congestion of the cables, and, apart from the delays referred to above in consequence of the accumulation resulting from the Spanish telegraph strikes, has given great satisfaction.

Marconi's Wireless Telegraph Co., Ltd.,
GODFREY C. ISAACS,
Managing Director.

London, W.C.,
June 13th, 1919.

Mathematics in Illuminating Engineering.

I read with much interest the article in your issue of the 6th inst. by Mr. G. W. Stubbings regarding the importance of elementary mathematics to engineers. Although not myself an engineer, may I add to his remarks that if gentlemen in the electrical and allied industries embraced that subject in their studies it would assist them to initiate improved ideas in their commercial organisation and sales campaigns, and thus enable more successful competition against much of the cheap and inefficient instruments and accessories introduced to the commercial market. It would command better prices in transactions, and correspondingly tend to forbid entry of that ignorant class who impudently pose as engineers, by exposing their inability to uphold foolish arguments and misleading statements upon subjects which mathematics can always successfully guard in science.

My mind is carried at the moment to the absurd statements issued and accepted regarding the relation of reflectors to visual "efficiency." The prevailing interpretation implied by advertisers of these, for commercial motives, gives inference which deludes the average engineer and public into the belief that foot-candle intensity is a more important factor to the eye than uniformity of that intensity (i.e., diversity factor).

It is well known to a few, and can in fact be proved by practical test, that an intensity of illumination may be from 33⅓ to 50 per cent. less in one case than another, but yet give perceptibly clearer vision when the installation is engineered by mathematics.

Uniformity in distribution of light upon surfaces, whether distributed by opal, prismatic, or any other reflectors, is equally in each case purely an application of mathematics, and if each or any or all (when properly manufactured) be adjusted by correct calculations taken from a photometric curve of the units employed, no eye would be able to distinguish a difference between the resulting foot-candle intensities obtained.

It cannot be too strongly urged in the interests of *bona fide* engineers and the promotion of more profitable commerce that "efficiency" in lighting is dependent upon mathematical, and not upon the so-called reflector efficiency, which latter is relatively an unimportant factor.

The much accepted "constant" ratios employed in adjusting lighting units should, I venture to say, be discouraged from an engineering point of view, because it will be found that mathematics do not support the claim to efficiency in distribution by such "constants," which have been accepted far too apathetically. Such systems also disguise the value of the engineering services actually needed, and make them apparently merely auxiliary to reflector service, which cannot assist the industry either as a profession or a science.

All this can be readily ascertained by those who care to calculate foot-candle intensities in varying ratios upon a square served by four units (any make of reflector) with one placed at each corner.

Space prohibits my offering examples here, but publication will issue shortly.

Sydney O. Cook.

London, S.E., *June 16th*, 1919.

LEGAL.

"UNLICENSED" TRAMCARS.

BEFORE Fleetwood Magistrates, on June 12th, the Blackpool and Fleetwood Tramroad Co. was summoned for using an unlicensed tramcar. Mr. Cottam, for the Fleetwood Council, said the case was brought to establish the right to require the licensing of all cars on the defendants' tramway. The company had challenged the right of the Council under the Act which it secured in 1896. It was admitted for the company that in past years it had paid a licence at the rate of 5s. per car, but its solicitor contended that this was not a legal charge. The Council might just as well try to licence the railway company running through the town. Mr. J. Cameron (tramways manager) said the licence had been paid in past years under a false impression. The Bench ruled that the Council had a right to license the cars, and the Tramway Co. was fined 20s. A case was stated for appeal.

COMPENSATION FOR CUT TELEGRAPH WIRES.

AT Ballymote (Co. Sligo) Quarter Sessions, before County Court Judge Wakely, the Postmaster-General was granted £20 compensation, together with £7 for expenses, for the malicious cutting of telegraph wires between Ballymote and Kilfree, by parties unknown.

BUSINESS NOTES.

The "Electrical Review" Index.—As it is still necessary to effect every possible economy in paper consumption, the Index to Vol. LXXXIV of the ELECTRICAL REVIEW, which will shortly be printed, will be supplied only to those who, through the post, specially apply for it. To such it will be supplied for 3d. post free. Any reader or advertiser at Home or Abroad who requires a copy for binding or other purposes is asked to make early application therefor to the Publisher, ELECTRICAL REVIEW, 4, Ludgate Hill, E.C. 4.

New French Companies.—There has been formed at Paris the Société des Lampes Eldea (L. D. Avellar et Cie.), with a capital of 500,000 fr., for the manufacture and sale of all kinds of electrical apparatus.

L'Etoile (Société pour la Fabrication d'Accessoires Déstinés à la Mécanique, l'Electricité et les Mines) is the style of a company formed at Aubervilliers, with a capital of 300,000 fr., for the purposes indicated in its title.

The Anciens Etablissements Berger has been converted into a company with a capital of 2,250,000 fr. Its specialities are the making and sale of all kinds of electrical goods, and in particular submersible and centrifugal pumps.

There has been constituted at Paris the Compagnie d'Exploitation Radio-Electrique, with a capital of 2,500,000 fr., whose objects are the purchase, sale, installation, and working in France and abroad of all kinds of telegraphic, telephonic, and wireless signalling apparatus.

Under the title of the Société P.M.E., a company has been formed at Paris with 102,000 fr. capital, to make and sell all kinds of mechanisms and electric motors.

The A.S.E. Ballot for a 44-Hours' Week.—The *Times* states that the result of the ballot among the Amalgamated Society of Engineers on the 44-hours' week is:—For, 64,908; against, 2,599.

According to the *Manchester Guardian*, a conference of delegates of the Amalgamated Society of Engineers is being held in Manchester. Among the questions to be considered is that of amalgamation with other Unions. This not only affects the A.S.E. in this country but also in America and Canada, where the Society has branches, with a considerable membership. The International Association of Machinists of America has sent over two representatives to investigate the matter. It has also been decided to invite to this country delegates from the Councils of the A.S.E. in America and Canada to take part in the discussion of the question.

Export Trade.—The British and Allies Merchants' and Brokers' Association (Parent), Ltd., has been constituted with offices at 343-5, Dashwood House, New Broad Street, London, E.C. 2, with the object of linking-up and consolidating the interests of manufacturers and traders within the Empire, and to foster the keen desire of the Allied nations for reciprocal trade with the British Empire. It is desired by means of a strong organisation to secure these objects and to annex a large proportion of Germany's pre-war export trade. The matter is fully explained in a folder that has been issued.

Factory for Sale.—Among the national factories for sale by direction of the Disposal Board, Ministry of Munitions, is that of the Willesden box factory, situate about one mile from Park Royal Station. The buildings comprise main shop, including machine, assembly and polishing shops, power and boiler houses, timber and loading sheds, offices and stores, and cover an area of over three acres.

Fire.—By a fire at Trafford Park on Thursday night, last week, two large warehouses, an engineering stores, two timber yards, and the estate office of the Trafford Park Co. were destroyed.

The Protection of Australian Industries.—The *Times* correspondent in Australia states that the Industrial Protection League has been inaugurated in Melbourne, under the patronage of Mr. W. A. Watt, Acting Prime Minister. The policy of the League predicates high Protection, its general purpose being set out as that of bringing to bear upon Parliament such a pressure of public opinion as will compel the Legislature to give Australian producers command of their own domestic markets and facilitate the development of a great export trade and of supporting candidates who will vote for an efficient Protective Tariff to Australian industries, especially key industries, which will make Australia, as far as possible, independent of external supplies.

Australian-made Cables.—In a note headed "The Real Australian Spirit," the *Industrial Australian and Mining Standard* states:—"The Electric Supply Committee of Melbourne City Council has given the lead to other public bodies in the matter of the encouragement of Australian industries. At a recent meeting of the Council it was announced that for the first time it had been possible to purchase Australian-made copper cables. The Committee recommended the acceptance of the tender of the British Insulated and Helsby Cables, Ltd., at £2,273 for the supply of 16 tons of assorted gauges. It was stated that the tender accepted was 9 per cent. higher than a British tender, 7 per cent. higher than an American, 14 per cent. higher than a Canadian, and 15 per cent. higher than a Japanese tender. The cable will be produced at the works of Metal Manufactures, Ltd., Port Kembla, New South Wales."

Engineering War Bonuses.—Two proposals are put forward just now regarding war bonuses in the shipbuilding and engineering trades. The employers seek a reduction of 5s. per week in the war bonus of skilled and unskilled men; the employés are asking for an advance of 15s. per week for skilled men, for time and piece workers.

A Belgian Metal Trust.—It is reported that Belgian manufacturers are endeavouring to form a metal trust with a capital of 300,000,000 fr. (£12,000,000), the object being to replace the numerous works destroyed in Belgium during the war by three or four large works each of which would specialise in the manufacture of certain articles.—*Times.*

German Industrial Investigation.—A German wireless message reports the foundation of a Society for Comparative Industrial Investigation, to study all questions connected with the reconstruction and development of German industry.—*Times.*

Business Correspondence with Germany.—It is announced, with reference to the General Licence of the Board of Trade authorising, on certain conditions, the supply and negotiations for the supply of foodstuffs to Germany, that, although the licence covers direct negotiations with firms in Germany in connection with the supply of foodstuffs, there is at present no direct postal communication between this country and the parts of Germany that are not in the occupation of the Armies of the Associated Governments, and that traders should therefore send their letters for those territories on matters covered by the General Licence through an intermediary in a neutral country.

Technical Teachers at Westinghouse Works.—Delegates attending the annual Conference at Bolton of the Association of Teachers in Technical Instruction, on June 11th, visited the works of the British Westinghouse Electric and Manufacturing Co., Trafford Park, where they found the works school of special interest.

Sales of Government Stores.—In connection with the sales of surplus Government property, samples of surplus and captured electrical instruments, telegraphs and telephones, have arrived in London, and have been arranged at the Exhibition at the Agricultural Hall. A reference to these stores will be found in our advertisement pages to-day.

Brazilian Industrial Delegation.—The Federation of British Industries is holding a luncheon at the Savoy Hotel, on Friday, June 27th, to afford members an opportunity of meeting the delegation from Brazil, who are coming to this country at the invitation of the Federation. The delegates will later visit the following centres:—Birmingham, Bradford, Bristol, Edinburgh, Glasgow, Leeds, Leicester, Liverpool, Manchester, Newcastle, Nottingham, Sheffield, and Swansea.

The delegation includes Dr. Pandia Calogeras, the Ex-Minister of Finance, Agriculture, and Commerce; and other eminent Brazilians. Members of the Federation of British Industries attached to the tour are Mr. Guy Locock, C.M.G.; Brig.-General A. H. Leggett, C.M.G.; Mr. Edmund L. Hill, general secretary; and others.

Electric Lamp Competition from the Continent.—A very considerable inflow of imports will ensue upon the decision to admit bulbs for electric lamps at the rate of 50 per cent. of the 1913 volume of business. Before the war we derived our principal supplies from outside, chiefly from Germany. For the present, Denmark and Holland look like profiting most by the modification of the embargo. It will require a good deal to convince some of the British manufacturers, however, that Germany is not the real country of origin as regards a large proportion of the supplies of glass goods which have been awaiting the moment for shipment from the Continent. Whatever warrant there may be for it, the belief is widespread that quantities of German glass have been passed over the frontier. This is assigned as one explanation of the offers of glass at the comparatively low prices which are being received from districts contiguous to Germany. During the last five years we have learnt to make electric lamp bulbs for ourselves. Special departments have been created for this manufacture at most of the glass houses of Birmingham and Stourbridge, and other districts have helped in overcoming past deficiencies. Progress has been rapid since 1917. Youths trained for the work have attained such skill that, mainly by dint of higher proficiency, factories have trebled their output. But with the best that we could do the shortage has not been overtaken. The readmission of a limited volume of imports will leave plenty of trade for the home producer—for the present. As to the possibilities of this branch in the future, some of our manufacturers are not too confident about holding the ground won unless effective means are taken to prevent unfair exploitation of the market. Many of them have gone into the business to rescue the country from a position which was full of peril. Their hope is that, in view of the importance of the industry to the safety of the State, the Government will not suffer it to be strangled by outside competition. The quality of the British-made bulb is spoken of very appreciatively, and it is stated that the output amounts to a quarter of a million a week. It is understood to be the intention to import bulbs wired ready for use.—*Birmingham Post.*

Foreign Trade.—The May Figures.—The following are the electrical and machinery figures given in the official returns of imports and exports for May:—

	May, 1919.	*Inc. or dec.*	*5 months*, 1919. *Inc. or dec.*
Imports.	£	£	£
Electrical goods, &c. ...	124,134	+ 43,005	+ 190,850
Machinery	1,118,144	+ 127,427	+ 2,128,375
Exports.			
Electrical goods, &c. ...	454,114	+ 79,113	+ 762,274
Machinery	2,664,378	+ 969,556	+ 3,187,210

Plant for Disposal.—The Disposal Board Ministry of Munitions is offering for sale the electrical plant for "Cottrell" precipitator at Oldbury Explosives Factory. For full particulars see our advertisement pages to-day.

Spain's Resurrection is Indubitable.—The Spanish Ambassador to the United States, Senor Juan Riano, contributes an article under the above heading to the May issue of *Ingeneria Internacional* (New York). After giving a *résumé* of recent industrial developments in Spain, he concludes:—

"Spain has now definitely started on several large undertakings, such as the new railway from the French frontier to Algeciras, the new railway from Madrid to Valencia, and from Madrid to Vigo. Further, she wishes to construct a railway to connect the naval base of Corunna and Ferrol, with Gijon, and thus complete the communication between Galicia, Asturias, and Vascongadas, by means of a line running along the Cantabrian coast. She wishes, too, to complete the network of strategic and military railways within the country, and to this end the Government guarantees a return of 5 per cent. per annum on the capital involved in its construction. She wishes to construct a port at Vigo in order to furnish adequate facilities for the big liners of the Vigo—New York Line.

"In addition to the important projects cited above, Spain offers many other openings for the investment of both Spanish and foreign capital, among which may be mentioned the electrification of some sections of the railways of the North; the construction of a good number of inter-urban tramways, such as that from Corunna to Santiago; the construction of dockyards in Malaga, in San Feiu de Guixole, and in other parts; the installation and exploitation of the free ports of Barcelona and Cadiz; the utilisation of large water-falls for the production of electric energy; the intensive exploitation of a large number of coal mines, mines of iron ore, copper, lead, wolfram, &c.

"All these offer, not solely a very lucrative return to American capitalists, but also grand opportunities for the United States to supply enormous quantities of material, machinery, tools, and manufactured commodities. This, of course, is well known to the directors of that powerful movement in America, which, since the cessation of hostilities, has devoted its energies towards capturing the markets of those neutral countries formerly dominated by the Central Empires. A large number of American financiers, engineers, manufacturers, and merchants, are already in the country studying its needs and possibilities, and many important firms are now establishing branches and agencies, or appointing representatives, in Spain."

Aerodromes as Factories.—Several aerodromes that are not permanently required for Government purposes, are to be disposed of. They are situated at Goldhanger and Stow Maries in Essex; two in Suffolk at Burgh Castle and Covehithe; one at Lilbourne, on the borders of Northants and Warwickshire; and the others are at Ramsey (Hunts), Telscombe (Suffolk), and Edzell (Kincardine). The various buildings are of brick, corrugated iron, and timber, with water supply and electric light installed, and could readily be adapted for factory purposes. Particulars from the Disposal Board, D.B.I.a.3., Room 135, Charing Cross Buildings, Villiers Street, W.C. 2.

Catalogues and Lists.—THE GENERAL ELECTRIC CO., LTD., 67, Queen Victoria Street, London, E.C.4.—Reprint of "S" Section catalogue dealing with electric lighting supplies. This has been brought up to date as far as prevailing conditions will permit by the inclusion of as many new patterns as are already available. Minor adjustments have been made in some of the list prices, which, however, stand approximately at the pre-war level, so that a single uniform advance applies to the whole catalogue section. Temporarily the prices of a few articles listed are withdrawn, as is intimated by a printed slip, but in most of these cases special quotations can be given on application. The issue of an entirely new catalogue with fixed list prices presents innumerable difficulties at the present time, whilst conditions are in such a state of rapid fluctuation. In consequence, the company have decided to tide over the period of transition by continuing to operate for the time being on reprints of the pre-war lists, each embodying such revision as can already be made. The "S" Section catalogue embraces distribution and cut-out boards; all kinds of branch switches, wall plugs, adaptors and connectors, ceiling roses cut-outs, lampholders, &c.

MESSRS. HIGGS BROS., Sand Pits, Birmingham.—Stock list of shunt-wound interpole motors for 110, 230, and 460 volts.

STERLING TELEPHONE AND ELECTRIC CO., LTD., 210-212, Tottenham Court Road, London, W. 1.—Advance copy of new folder ("Has Anybody here seen Mr. Brown?") briefly describing the Sterling staff signalling system.

Book Notices.—*Faraday House Journal.* Vol. VIII, No. 3, June, 1919. London: Faraday House.—In this issue, besides the usual supply of notes of interest to students, reference is made to Dr. N. Campbell and Mr. C. C. Paterson's recent paper on "Some Characteristics of the Spark Discharge and its Effect in Igniting Explosive Mixtures," read before the Physical Society of London. The object of the investigation was to determine the relation between the electrical characteristic of a spark discharge and its power of igniting explosive mixtures. Regarding the 1918 edition of the Standardisation Rules of the A.I.E.E., criticism is levelled against the lay of a wire of a stranded conductor being defined as the "pitch of the twist" of a wire. Dr. Alex. Russell, in an interesting though rather mathematical contribution on how to obtain constant current circuits from constant potential circuits and conversely, describes three of the simplest methods of doing so.

"George Westinghouse: his Life and Achievements." By F. E. Leupp. Pp. vii + 303 and 11 illustrations. London: John Murray. Price 15s. net.

"Physical Laboratory Experiments for Engineering Students" (Part I—Mechanics, Sound, Heat, and Light). By S. Sheldon and E. Hausman. Pp. v + 134 40 figs. London: Constable & Co. Price 6s. net.

"Circular No. 24 of the Bureau of Standards." Contains lists of the publications issued by the Bureau, consisting of scientific and technologic papers, circulars, and miscellaneous publications, also Supplement No. 1 to the Circular. Washington: Government Printing Office. Price 25 cents.

The Provincial Electric Supply Committee of the United Kingdom.—At the second annual meeting of the General Committee of the Provincial Electric Supply Committee, on May 27th, 1919, Mr. H. B. Renwick, chairman of the Committee, said that the year 1919 was likely to become one of the most momentous in the history of the industry, which was at last to be freed from the paralysing parochial fetters which had bound it all these years—at least, that is what people said. It was now admitted by Parliament to be a key industry—the one industry which was to rescue the trade of the country from possible bankruptcy. All he would say at that moment was—better late than never. He saw no reason why they should not make a good job of it now, if it were handled in a statesmanlike way—on big, broad lines, freed from party politics, and with a proper regard to the fair claims of the supply industry and the real needs of the country.

The subscriptions had increased to £244, while working expenses for the year amounted to the modest sum of £114. Two special items—the subscription to the Federation of British Industries and arbitration expenses under Award 2,772—were met by funds specially contributed by certain member-companies. The balance in hand was £280. The membership had increased from 106 to 120, and covered practically all the provincial provisional-order companies in the United Kingdom.

The Committee had taken effective action in connection with the Statutory Undertakings (Temporary Increase of Charges) Act, and the Ways and Communications Bill. Another matter which had engaged a great deal of time and attention was the Labour question; the past year had been one of almost unintermittent demands for increases of wages by Trade Unions and of awards under the Ministry of Munitions or the Ministry of Labour, and the Committee had dealt with all these cases whenever they affected the Provincial Electric Supply Committee. The thanks of the Association were particularly due to its two representatives—Mr. Wigham and Mr. Scott-Moncrieff—who had both devoted to these matters a very considerable amount of time during the year.

The question of Labour was the one disturbing element, not only in this industry but in all other industries, which threatened to retard indefinitely the commercial recovery of the country after the war, and to interfere with production, which was the one vital factor in post-war problems.

The Committee was doing its best to give the Government proposal of National Industrial Councils every chance. The Ministry of Labour called the first meeting of the Industrial Council on May 1st, and the Association was fully represented on that Council. He was a firm believer in the principle of closer co-operation between employers and employés as a solution of Labour difficulties, but he was not sure that the machinery adopted under the National Industrial Councils would give the favourable results which many anticipated.

The Committee had become a member of the Federation of British Industries, through the generosity of the bigger companies on the Committee.

In the matter of income-tax allowances, the Committee had obtained some concession. It had obtained the provisional consent of the Somerset House Authorities for Electricity Companies to be included amongst those entitled to the special assessment on buildings detailed in a memorandum sent to members. The question of rating, too, had engaged a good deal of attention.

The Committee was invited by the Institution of Electrical Engineers to co-operate with them in forming a Committee to establish a national proving house; this matter had a very important bearing for electric supply companies, and called for their support. The Committee was also represented on the Electrical Standards Committee.

In connection with the Household Fuel and Lighting Order, 1918, the Committee was represented at the numerous conferences which took place. From an electric supply point of view, the Order was as satisfactory as could have been attained under the circumstances. He thought it was now fully appreciated, as they had always insisted, that small reductions in electricity used for lighting purposes did not necessarily result in any appreciable saving of coal at generating stations. The Committee assisted the Coal Controller in connection with circulars urging on the public the necessity of economy in coal for household use, and a large number of member-companies distributed circulars in their correspondence, &c., both in the National interest and also as having a bearing on their own interests.

Mr. Renwick's remarks on the Electricity Supply Bill will be abstracted in a later issue; a private discussion on the subject followed his address.

Trade Announcements.—MESSRS. R. H. LONGBOTHAM AND CO., LTD., who have been established at Wakefield for over 30 years as engineers and machinery merchants, and have carried on an extensive business in general machinery, especially mining, electrical, and contractors' plant, are removing this month to Doncaster. They have sold their works at Wakefield, and are making their head office at 41, Station Road, Doncaster. The Newcastle office will remain at Milburn House (a).

MESSRS. PINKNEY & FORSTER have set up in business as electrical engineers and contractors at 11, Princess Street, Newcastle-upon-Tyne, and they wish to receive catalogues from manufacturers of fittings, accessories, heating and cooking apparatus, &c.; also country house lighting plants, batteries, and so on. Both partners have just been demobilised. Mr. Pinkney was a captain in the Tyne Electrical Engineers, R.E., being in command of No. 3 Anti-Aircraft Company, R.E., York., at the time of his demobilisation, and Mr. Forster was a lieutenant in the 6th Northumberland Fusiliers. Prior to the war both gentlemen were with Messrs. Robson and Coleman, electrical engineers and contractors, of Newcastle.

MESSRS. HAMILTON & M'PHERSON have commenced business as electricians at 34, Caledonian Road, Wishaw.

MESSRS. HOOPER'S TELEGRAPH AND INDIA-RUBBER WORKS, LTD., have removed their City offices to 5, Drapers' Gardens, London, E.C.2. Telegraphic address: "Linear, Stock, London." Telephones: "London Wall 401."

MESSRS. SPEEDY & EYNON have removed from Duke Street, Adelphi, to 22, Essex Street, Strand, W.C.2. They will be glad if firms will send copies of their new catalogues with up-to-date prices.

Mr. H. T. W. Bowell has relinquished his work at the War Office, and resumed the management of the SILENT ELECTRIC CLOCKS Co.'s business at 192, Goswell Road, E.C.1. During the war every man of military age in the employ of the company joined the Forces, and several over age undertook work of national importance; but, nevertheless, a considerable number of installations were carried out. The staff are now returning to work, and a new catalogue is in preparation.

MESSRS. SIDNEY & ELLIS have commenced business as electrical engineers and contractors at 12, Barton Street, Bath, and they desire to receive catalogues and prices from manufacturers and factors.

T O K Rotary Switches.—We are glad to be able to divulge this week the secret of the mystery attaching to the word T O K, which has appeared in our advertisement pages for some weeks without explanation. The T O K MANUFACTURING CO., LTD., of Empire Works, West Ham Lane, London, E. 15, is putting on the market a line of rotary switches to take the place of the American switches which have been widely used on British cooking and heating apparatus. The T O K switches will be made in England, of British materials, by British labour, with British capital. They are new only in that sense; the company has adopted a design of approved merit, and will keep the fixing and wiring centres the same, so that there will be no hindrance to the substitution of the British for the foreign switch. For some time it has been difficult to obtain a supply of these rotary switches; that difficulty is now removed, and we are sure that users will be only too glad to place their orders with a British firm. The business is in the capable hands of Mr. H. H. Holmes, the late sales manager of Marylebone electricity supply department, and Mr. E. E. Sharp, of Venner Time Switches, and Chamberlain & Hookham meters (he is giving up the latter connection), and we wish all success to the new venture.

Liquidation.—ENGINEERING PROPRIETARY, LTD., 97, New Bond Street, W.—First meeting of creditors and contributories, June 24th, at Carey Street, W.C.

Electrical Trade in the Dutch East Indies.—In the course of an article in the *Bulletin* of the F.B.I. on "Trade Prospects in the Dutch East Indies," the writer says:—"Electric lighting is very popular, and it is extending all over the Archipelago. Even the smaller towns have, or are about to construct, electricity works, and many of the estates have their own electric supply. There is, therefore, a constant demand for electric lamps, switches, and all kinds of equipment. Small sets for estates, driven by oil engines, would find a ready market. This trade was largely in the hands of Germany before the war."

LIGHTING AND POWER NOTES.

Aberystwyth.—Proposed Purchase.—The Electricity Supply Corporation has acknowledged the Council's offer of £20,000 for the Aberystwyth electricity undertaking, and states that the directors are prepared to enter into negotiations, and asks for an interview with a Committee of the Council. The matter has been referred to the Public Works Committee, with power to appoint a small Committee.

Accrington.—Proposed Extensions.—Ald. Higham, referring to the proposal to borrow £85,000 for extensions to the electricity works, said the L.G.B. was going to have an inquiry into the application. Sir John Snell had already granted an application for a large sum of money for extensions—in fact, the erection of an entirely new station at Blackburn, involving well over a quarter of a million. In all probability, Accrington would have no difficulty in getting its grant for the extensions. A similar concession of borrowing powers was foreshadowed at Burnley, and he believed Nelson and Colne had also been advised to get on with their schemes. This was in contradiction to the policy of erecting a big power station which was going to do the whole of the generating for them.

Argentina.—E.L. Scheme.—An electric generating station for power, light, heating, and general purposes has been authorised for the port of Santa Cruz, according to the *Boletin Official* of April 9th. The concession is for 25 years, and applies to the municipality of Puerto-Santa Cruz, but the village of Paso Ibanez must also be supplied with energy when its population reaches 1,000 inhabitants. The generating station must produce 200 kw. per hour. The types of cables for various voltages are specified, also the tariff to be imposed for lighting, heating, installation, and other purposes. There are also a number of obligations imposed on the concessionnaire and on the public who may use the energy.

Batley.—Loan Sanction.—The T.C. has received L.G.B. sanction to borrow £4,118 for extensions of electricity mains.

Burnley.—A report regarding the proposed extension to the electricity works had been prepared by Mr. E. M. Lacy, the electrical expert, which is to be forwarded to the B. of T. for consideration in connection with the general scheme of generation in the district.

Blackpool.—Price Revision.—A charge of 33⅓ per cent. is to be made for electricity instead of 15 per cent. as heretofore. The present lighting and power tariffs will remain but the heating and cooking tariff of 1½d. will be increased to 1¾d. per unit.

Bolton.—Loan Application.—The Corporation has decided to apply to the L.G.B. for sanction to borrow £5,582 in addition to the sum of £23,032 for the cost of alteration to the system of distribution and sub-station equipment to enable the electricity department to carry out the work which was contemplated when the application for sanction to borrow was originally made in 1915.

Price Revision.—The following increases have been decided on:—Lighting and power charges to be increased by 0·1d. per unit; bulk and special agreement rates to be increased by 0·02d. per unit.

Broadstairs.—Public Lighting.—The U.D.C. has decided to have tried on the sea front, for use during July, August and September, 10½-watt lamps, on the understanding that the Isle of Thanet Electric Tramways and Lighting Co. installs the lights, and maintains them, for 18s. each per month.

Bury.—Year's Working.—There was a loss on the year's working of the Corporation's electricity department of £1,983, against an estimated profit of £1,650. This was due to the reduction in the demand for power since the Armistice was signed. Coal cost £20,200, against £14,600 during 1915-16, and wages went up from £5,132 to £10,706 during the same period.

Callington.—Loan Application.—The Urban Council is to apply to the L.G.B. for sanction to a loan for the installation of electric light.

Colchester.—Price Revision.—The T.C. has decided to increase the charge for energy for lighting to the statutory maximum of 8d. per unit, and for power, including the tramways, by about 25 per cent.

Canada.—The annual report of the working of the Toronto hydro-electric system for the year 1918 shows a gross income of $2,353,443, while working expenses amounted to $1,485,613, leaving a gross profit of $867,830. Deducting interest, depreciation, and sinking fund charges ($846,163), there remained a surplus of $21,666. During the year, in accordance with statutory requirements that charges for municipal services be on a cost bases, the system was required to pay to the city $22,317 as a rebate on the 1917 street-lighting account, and to reduce the rate for the year 1918 from $8 to $7 per lamp per year, which resulted in a saving to the city of approximately $15,000.

During 1918 230,413,561 units were sold as compared with 171,691,213 in 1917, the connected load amounting to 184,930 H.P. and the peak load to 60,154 H.P.; the meters in use numbered 53,598, against 50,461; street lanterns, 29,527, against 45,841. The increase in the gross income over that of 1917 was 14·9 per cent., and the increase in the commercial income over that of 1918 was 24·7 per cent. The commercial income for the year amounted to 78 per cent. of the total, compared with 71·8 per cent. in 1917, 67 per cent. in 1916, and 55·05 per cent. in 1913. Power purchased from the Hydro-Electric Power Commission of Ontario during 1918 cost $824,251, compared with $684,470 in 1917.

Chobham.—E.L. Scheme.—The Woking Electric Supply Co. has informed the P.C. that it has taken the necessary preliminary steps with a view to supplying electricity to the parish, and that mains would be laid directly the consent of the B. of T. had been secured. The company is to be asked for terms for public lighting.

Continental.—France.—The growth of water-power undertakings in the French Alps in the last few years is, according to M. Blanchard, truly noteworthy. In the pré-Alps du Nord little progress is to be noticed, but along the sub-Alpine lowlands, and especially in the basins of the Arly and the Drac rivers, it is very considerable; here the H.P. has risen from 171,000 to 233,000. In the great inner Northern valleys the increase is 24,000 H.P. on the Romanche, and 27,300 H.P. in Maurienne. An outside group is in full development on the streams flowing beyond the Alps system. These comprise the Bellegarde, Fier, Jonage and Lower Isère regions. The power here utilised has grown in two years from 31,000 to 129,000 H.P. In the Southern Alps, the Durance Valley has been further equipped by the Ventavon and Sisteron works, and by the St. Tulle works, under construction; the growth is equal to 63 per cent. on 1916. Up to the middle of 1918 therefore, the progress in the Southern Alps stands for a total of 250,000 H.P. installed; in the Northern Alps, 800,000 H.P., or a total for the French Alps of 1,650,000 H.P., a figure which exceeds those of Italy and Switzerland; moreover, schemes shortly to be completed will easily swell this total to 1,500,000 H.P.—*L'Electricité.*

The Société Hydro-Electrique de la Bridoire has been formed at Lyons, with a capital of 1,250 000 fr., for the working of a waterfall on the Tiers and erection of a hydro-electric station at Bridoire, Department of the Isère.

The Société des Forces Motrices de Vercors is the applicant for a concession to generate electricity on the Isère. A station is to be built on the left bank of the river at Pisançon, Department of the Drôme.

The Energie Electrique du Littoral Méditerranéen has applied for a further concession on the river Durance, making the fifth owned by this company on this river, three of which are working, generating 70,000 H.P., another works of a capacity of 40,000 H.P. being under weigh, and expected to be finished by the end of the year.

Italy.—There has been established at Genoa the Società Electrica Alto Tanaro, for the working of a hydro-electric plant on the Tanaro river and other purposes. Capital, 100,000 lire.

To study and promote the use of electric furnaces, erect factories, &c., in the Trentino region, the Industrie Elettriche Trentine has been formed at Milan, with a capital of 1,500,000 lire. Six electric undertakings, two banks, and the Meridional Railway Co. are the foster parents of the concern.

Spain.—The Sociedad Hidro-Electrica Galle, of Madrid, has secured a concession to put down plant to utilise the water power of the river Tajo, at Acebache, to generate electrical energy for lighting and power purposes.

Sweden.—Among the new companies recently formed in Sweden in connection with the distribution of electricity for lighting and power purposes are the Utomhertens Elektriska Aktiebolag, of Ha, and the Elektriska B.S.H. Aktiebolag, formed at Lit.

Coventry.—Year's Working.—The annual accounts of the Corporation electricity undertaking show a profit for the year of £12,649, and an available surplus (including the amount brought forward) of £13,547. £5,000 is to be allocated to the relief of the rates, £8,280 applied in meeting various capital charges, and the balance carried forward. Last year's accounts showed £16,321 profit.

Crewe.—Year's Working.—There was a deficit of £727 on the working of the electricity department for the past year.

Price Revision.—The price of electricity is to be advanced by a further 20 per cent.

Crook (County Durham).—E.L. Scheme.—The Council has decided to consider the question of electrically lighting the town. It is also proposed to instal a refuse destructor with a view to its use in generating electricity.

Darlington.—LOAN APPLICATION.—The Corporation is to apply to the L.G.B. for sanction to borrow £25,000 for new generating plant at the electricity works.

Douglas (I. of Man.)—E.L. SCHEME.—The T.C. is to obtain expert advice in connection with the supply of electricity in the borough, and especially with regard to the powers sought by a newly-formed company.

Dover.—The electrical engineer states that the Colliery Co. is not able to supply additional power, as had been hoped, and he advises extensions to the plant. The T.C. has deferred the matter for six months.

Ferrybridge.—DEFERRED E.L. SCHEME.—The proposed E.L. scheme submitted by the Yorkshire E.P. Co. is to remain in abeyance until the Government has dealt with the Bill now in Parliament.

Hatfield.—PROPOSED MAINS EXTENSIONS.—The South Metropolitan E.L. Co. has informed the R.D.C. that the demand for energy would not justify it extending the mains to Hatfield. The Council has decided to persevere in the matter, and to circularise the district, including East Hyde.

Holmfirth.—EXTENSIONS.—The U.D.C. is to proceed with the extension of the electricity service to Spring Bank, Burnlee, at an estimated cost of £800.

Horwich.—E.L. SCHEME.—The U.D.C. is to approach the Bolton Corporation and the Lancashire Electric Power Co. as to the supply of electricity for lighting and power purposes in Horwich, and ask for terms for supplying the Council in bulk.

Houghton-le-Spring.—PUBLIC LIGHTING.—At the request of the U.D.C. the E.L. Co. has agreed to prepare a provisional estimate for public lighting.

Low Moor (Bradford).—MAINS EXTENSIONS.—The Bradford E.C. has authorised the extension of electricity mains at Carr Lane, Low Moor, including transformer chamber, at an estimated cost of £405.

Lytham.—LOAN APPLICATION.—The D.C. is applying to the L.G.B. for sanction to borrow £35,500 for the purpose of electric lighting.

Manchester.—YEAR'S WORKING.—The financial results of the past year's working were dealt with in our last issue. The annual report further states that during the year the average price paid for coal had risen 3s. 5d. per ton, and the average weight of coal consumed had fallen 0·09 lb. per kelvin sold. During the year 235,258,030 kelvins, against 236,463,740, were generated, and 184,675,199, against 195,582,784, were sold; private consumers taking 155,480,090 kelvins; public lighting 266,255 kelvins; and traction 28,928,845 kelvins. The total maximum demand was 65,050 KW., lighting and power 55,050 KW., and traction 10,000 KW. During the year the installation of two 80,000-lb. B. & W. water-tube boilers has been completed; the erection of the 25,000-KW. turbo-alternator has been commenced, and the contract for additional fan-driven cooling towers is near completion. Important extensions to four distributing stations are not yet complete, owing to non-delivery of plant by the makers. No material additions to the list of new supplies have been made, but on mains an addition of over 5 miles is recorded. The efficiency of the distributing system, as a whole, equalled 87·85 per cent.

LOAN.—The T.C. has approved of the proposal to borrow £1,160,000 for the erection of the new generating station at Burton.

Morley.—BULK SUPPLY.—The T.C. has applied to the Leeds E.C. for a supply of electricity in bulk to supplement Morley's own supply, which is not sufficient to meet local demands.

Oldham.—YEAR'S WORKING.—There was a profit of £8,322 on the past year's working of the Corporation electricity department, compared with £7,500 twelve months ago. Coal has cost £4,600 more, and the quantity used per unit sold was 3·40, against 3·45 lb. the previous year.

Portrush.—TIME EXTENSION.—The B. of T. has extended the Lighting Order for a year from August next, when the laying of the mains, cables, &c., was to have been begun. The L.G.B. also acknowledged the receipt of the Council's application for the sanction of a loan of £10,500 from the Belfast Banking Co. in connection with the lighting scheme of the town.

Rochdale.—An agreement with regard to a supply of electricity has been arrived at with the Lancashire Electric Power Co. One with the D.R. Cotton Mills is in process of completion.

South Staffordshire.—WATER-LOGGED MINES.—As a result of the Federation of British Industries having taken up the question of the flooding of the Tipton and South Staffordshire coalfields, the Controller of Coal Mines has decided immediately to proceed with the installation of electrical pumping machinery.

Stockport.—PRICE INCREASE.—Electricity charges are to be increased by 10 per cent. to consumers who have not a special agreement.

Sunderland.—YEAR'S WORKING.—The annual report on the Corporation's electricity undertaking for the year ended March 31st last, shows that there was a loss on the year's working of £3,880. The income totalled £103,636, of which £15,148 was received from the Corporation and £86,838 from private consumers. Expenses amounted to £75,363, leaving a balance to be carried to the net revenue account of £28,274. After paying interest on capital, &c., there was a balance for the appropriation account of £15,999, to which must be added a contribution of £3,880 from the rates to meet repayment of loans. There are now 1,785 consumers, and the number of kelvins sold last year amounted to over 18½ millions, the cost per kelvin sold being 1·40d. The total loans repaid to date amounted to £204,681, and loans outstanding were £217,010. Superseded plant repaid was put down at £82,919, leaving only £5,767 to be provided for this purpose.

Wigan.—L.G.B. INQUIRY.—The L.G.B. has held an inquiry into the application of the Corporation for sanction to borrow £101,250 for extensions to plant at the electricity works. The details were:—5,000-KW. turbo-alternator, £25,000; surface condenser, £11,000; switchgear, £9,000; alterations to boiler house, £9,000; two boilers, 35,000 lb., mechanical stokers, economisers, £22,000; contingencies, £11,000. The present plant amounts to 4,820 KW., and there is a bulk supply from the Lancashire Power Co. of 1,500 KW. There is on order at the present time one 5,000-KW. turbo-alternator. Exclusive of traction there were demands for 8,864 KW.

Worcester.—LOAN APPLICATION.—The C.C. has approved of the application for a loan of £15,350 for plant and cables. A firm which wishes to establish a factory will require about 100,000 or 150,000 units per annum.

TRAMWAY AND RAILWAY NOTES.

Ashton-under-Lyne.—EXTENSIONS.—The T.C. has decided to borrow £25,000 for tramway extensions.

Blackburn.—YEAR'S WORKING.—The annual report on the tramway's undertaking for the year ended March 25th, 1919, shows that receipts totalled £94,992, against £80,361, and expenditure £69,021, against £53,232. After repayment of loans, £5,597, sinking fund, £10,612, interest on loans, £3,548, and other items, there was a profit of £6,650, against £6,971. Traffic records show the following increases:—Mileage, 28,373; passengers, 1,637,574; cash, £14,252; and parcels traffic receipts were £2,048. The following are the increases in the chief items of expenditure compared with the previous year:—Wages, £5,715; income-tax on profits, £1,291; permanent way repairs, £2,654; cars, £1,230, and electrical energy, £1,167. The amount spent on permanent way fell short of that which ought to have been expended by £3,000, and the amount required to bring it up to date is £8,000. Increases in wages and decreases in working hours, granted since the close of the financial year, are estimated to cost £7,000 per annum.

Continental.—FRANCE.—The comprehensive scheme for the electrification of French railways under contemplation was lately set out by M. Jules Cels, Under Secretary of State for Public Works and Transport, in the *Petit Parisien*:—3,000 km. on the Western network, 2,800 on that of the Midi, and 3,000 on the Paris-Lyons-Mediterranean network was what was contemplated. The outcome of the electrification would mean a saving of 3,000,000 tons of coal per year. The Western would be fed by 165,000 H.P. drawn from the river Dordogne, the Midi from works in the Pyrenees, and the P.L.M. from the Alps. The network to be electrified would be circumscribed by the Bordeaux-Bayonne on the side of the Atlantic, the Bayonne-Perpignan-Marseilles-Ventimiglia on the side of the Mediterranean; the Northern will close up on the system of the Bordeaux-Lyons-Modane. In total the scheme would embrace the whole of the Southern network.

ITALY.—Idroelletrica Cisalpina S.A. per la Produzione di Energia Elettrica, with a capital of 2,000,000 lire (increasible to 20,000,000 lire), has been formed at Milan to supply electricity for tramway, railway or river traction, or to execute and work electrical plant for self or third parties. The Northern Railways Co. and six large electric companies are promoters of the undertaking.

The Paris transport strike ended on Monday morning last; a general strike of French coalminers, however, began officially on the same day.

Cork.—STRIKE THREAT.—A strike of tramway employés last week was temporarily averted through the intervention of the Cork Conciliation Board—an influential citizens' committee formed for the arranging of local trade disputes. The men put in their claim on the lines of the National demand for a weekly wage of 50s. and a 44-hours' week. The notice expired on the 7th inst., but on the intervention of the Board, the men agreed to continue working, and to bring their case before the Board for adjustment. The Board awarded the men 4s. per week increase, with a reduction in working hours, and this finding has been tentatively ratified by the men.

Conductresses.—All the women employed on the Walthamstow tramways have now left. The Preston T.C. has approved of the decision to replace all conductresses, the women to be given time to find fresh employment. The Newcastle branch of the Amalgamated Association of Tramway and Vehicle Workers is pressing for the dismissal by July 1st of conductresses still employed. There are now 250 women employed out of the 400 working at the time of the Armistice and 100 pre-war male employés have yet to be demobilised.

Dundee.—Price Revision.—The electricity convener is willing to reduce the tramway electricity charges to 1½d. per unit if the repair of the equipment is taken over, and it is expected the Corporation will approve of the arrangement.

Holmfirth.—Proposed Extensions.—The U.D.C. has referred to a Committee a suggestion for the extension of the Huddersfield tramcar service to the district.

Ilford.—The Council tramways manager has been asked to report on the question of running motor-omnibus services.

London.—Fires.—The first fire which has yet occurred on an electric train of the L. & S.W. Railway, took place on Friday last week. As a train was approaching Clapham Junction, a fire, believed to have been started by sparks from a steam engine, broke out on the roof of one of the centre coaches. The train was stopped, and passengers got out and walked to the station. The fire was extinguished, and the train was soon afterwards put back into service.

A fully-laden L.C.C. tramcar took fire on Tuesday, last week, in Peckham Road. No one was injured.

Canada.—Strike.—The local tramway employés at Toronto, at a mass meeting, voted to strike on Monday last. At the request of the executive officers of the Union, a decision was reached to delay the strike for one week, but the meeting declined to name a representative for the Government Board of Conciliation.

Malvern.—The U.D.C. has decided to dissent from the application to revive the powers granted by the Funicular Light Railway Order, 1911, to enable it, if necessary, to appear at any inquiry into the matter.

New Zealand.—The ratepayers of Auckland have ratified the City Council's proposal to purchase the tramways, at a cost of £1,180,000.

TELEGRAPH AND TELEPHONE NOTES.

Automatic Telephones.—An automatic telephone system came into operation at Huddersfield on Saturday. The telephone exchange for the town and district has been transferred to the new post office buildings.

Cable Censorship Restrictions.—The Government is to be asked to receive a deputation from the London Chamber of Commerce, when the desirability of a considerable relaxation in the present cable censorship will be urged. The removal of restrictions on the use of private cable codes on account of the "serious effect of such restrictions upon British trade, particularly with the Dominions," will also be asked for.

Protests against cable delays to South Africa have been made in the House of Assembly.

Telephone (In.) Efficiency.—Our esteemed, if frivolous, contemporary, Mr. Punch, makes a subtle thrust at the deficiencies of the telephone system by a neat adaptation of the old classical tag, "*Nulla dies sine linea*," into "*Nulla linea sine die*," which is, being interpreted, "No line till further notice," which it is regretable to state is the fate of many a hapless Briton to-day.

United States.—A Bill for the construction of a submarine cable, at a cost of £1,600,000, stretching from the Pacific Coast to Manila, in the Philippines, and to some Asiatic ports, by the United States Government, has been introduced in the Senate.

A message from Copenhagen refers to reports of plans for a new direct cable between either Sweden or Norway and the United States.

The first steps towards a settlement of the widespread strike of telegraphists were taken on June 13th, when the Commercial Telegraphers' Union of America submitted to the Postal Telegraph Co. conditions upon which an agreement might be based. These were that the company should agree to certain wage adjustments immediately after full control of the telegraphs had been restored by the Government.

A message from Washington states that the strike is not likely to delay telegraphic traffic, and reports from telegraph companies everywhere indicate that the strike thus far has been a failure.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Australia.—Sydney.—June 23rd. Municipal Council. One 60-ton electrically-driven overhead travelling crane. Electric Lighting Department, Town Hall, Sydney.*

Newcastle.—July 14th. T.C. Single-phase watt-hour meters if different sizes, and single and three-phase transformers. Electrical Engineer and Manager, Corporation Electricity Works, Newcastle, N.S.W.

*A copy can be seen at the Inquiry Office of the Department of Overseas Trade (Development & Intelligence), London.

Atherton.—U.D.C. Two 45-k.v.a. air-cooled transformers, 2,400 to 240 volts. (See this issue.)

Bedford.—July 14th. Electricity Committee. One 1,500-kw. 1-phase turbo-alternator and condensing plant, boilers, superheaters, mechanical stokers and induced draught plant, e.h.t. switchgear, water softener, feed-water heater and storage tanks, water-measuring apparatus, feed pumps. (See this issue.)

Birkenhead.—July 28th. B. of G. Installation of internal telephones. (June 6th.)

Colne.—July 4th. Electricity Department. Supply, drawing-in and jointing of approximately 2,200 yd. '05 sq. in., 3,300-volt, 3-core cable. (See this issue.)

Darlington.—July 11th. Electricity Department. Rotary converter, cooling tower, water-tube boiler, economiser, and induced draught fan. (See this issue.)

Eccles.—June 23rd. Electricity Committee. Supply and laying of three-way underground ducts; supply and drawing-in 2,733 yds. of '20 sq. in., e.h.t., three-core cable. (May 30th.)

Gravesend.—July 12th. Electricity Department. One 2,000-kw. turbine with 6,000/6,600-volt 3-phase alternator, condenser with motor-driven air and circulating pumps. (See this issue.)

London.—June 25th. Metropolitan Water Board. Three, six or eight months' supply of electric lamps, electric wire and accessories. Chief Engineer, 2, South Place, Finsbury, E.C. 2.

Paris.—July 10th. Administration des Postes et Télégraphes. Supply of multiple commutator switchboards. Particulars from Direction de l'Exploitation Téléphonique, 4, Bureau, 103, Rue de Grenelle, Paris.

Portsmouth.—July 3rd. Electricity Department. Water-tube boiler, steam capacity 20,000 lbs. per hour (See this issue.)

South Shields.—June 25th. Tramways Committee. Five or 10 double-deck, top-covered cars. Mr. J. C. Whiteley, General Manager and Engineer, Dean Road, South Shields.

Tasmania.—Launceston.—July 28th. City Council. Sub-station equipment, battery, reversible booster, switchgear, &c. City Electrical Engineer.

West Ham.—July 1st. T.C. 20 single-truck electric tramcar bodies, with roof covers. Mr. L. Slattery, General Manager, Greengate Street, Plaistow, E. 13.

CLOSED.

Australia.—Commonwealth. Department of Works and Railways:—

250 projector fittings for peace celebrations, £806.—British General Electric Co., Ltd.—*Tenders.*

Bishop's Castle.—B. of G. Electric bell installation. Mr. Winman.

Holmfirth.—The contract for the electrical work in connection with the Council's housing scheme in Newmill Road, has been let to Mr. C. R. Tolson.

London.—Islington.—Lighting Committee. Recommended:—

One 5,000-kw. turbine, coupled to two-phase Vickers alternator, with condensing plant, &c., £46,979.—Richardsons, Westgarth & Co., Ltd.

Malvern.—U.D.C. Electric meters. The Electrical Apparatus Co.

Sunderland.—T.C. Accepted:—

Steel joists.—Redpath, Brown & Co., Ltd.
Switchgear.—Ferguson, Pailin & Co.
Cable.—B.I. & Helsby Cables, Ltd.
Wood-capping.—Joseph Thompson & Co.

Watford.—U.D.C.:—

Ljungström turbo-alternator.—Brush Electrical Engineering Co., Ltd., £18,420.
Motors.—Parkinson & Co., £300.

FORTHCOMING EVENTS.

Incorporated Municipal Electrical Association.—Friday, June 20th. At 10 a.m. Annual convention. At the Spa Pavilion, Felixstowe. Annual general meeting.

Society of Technical Engineers (Woolwich Branch).—Friday, June 20th. At 6 p.m. At the Shakespeare Hotel, Powis Street, Woolwich. Discussion on "The Third Party Policy."

Institution of Mining Engineers.—Friday, June 20th. Visit to the Docks and Warehouses of the Port of London Authority.

Industrial Reconstruction Council.—Wednesday, June 25th. At 4.30 p.m. At the Saddlers' Hall, Cheapside, E.C. Lecture on "Some Industrial Problems," by the Rt. Hon. C. W. Bowerman, M.P.

Institution of Electrical Engineers.—Wednesday, June 25th. From 8 p.m. to 11.30 p.m. At the Natural History Museum, Cromwell Road, S.W. Conversazione.

Thursday, June 26th. At p.m A the Connaught Rooms, Gt. Queen Street, W.C. Reception, 7.3 p.m Annual dinner

NOTES.

Birmingham Electrical Golfing Society.—The first post-war meeting will be held at Moseley on Monday, June 23rd. There will be two handsome cups and other prizes up for competition. The annual subscription has been increased to 7s. 6d. Applications for membership can only be considered from those in the electrical engineering or manufacturing occupations. Applications for membership should be addressed to the honorary secretary, Mr. W. A. Miflinger, 9, Livery Street, Birmingham.

Government Motor Sales.—The Disposal Board of the Ministry of Munitions last week continued its sales of surplus motor vehicles at the Agricultural Hall, Islington.

The Electrical Training of Demobilised Officers.—At a meeting of the Hull Corporation Electricity Committee a letter was read from the Ministry of Labour, Appointments Department, asking if the Committee would allow demobilised officers to be trained as electrical engineers. The electrical engineer explained that they had not previously taken apprentices, as they required the "finished product." In this case they would not pay anything, as the Ministry assisted the officers whilst they were undergoing training. Councillor Mell thought the "men" as well as officers should have an equal chance. Eventually the matter was left to the chairman and deputy chairman to report to the next meeting.

Electrical Engineers' Memorial Service at Westminster Abbey.—On Wednesday at noon at Westminster Abbey a service in memory of members of the engineering profession who have fallen in the war was held. We shall refer to the matter in our next issue.

Diesel Engine Users' Association.—At the May meeting of the Association the subject of insurance of Diesel and semi-Diesel engines against breakdown was discussed. The Association proposes to take action in regard to carrying out research work with a view to obtaining more definite information as to the suitability of various classes of liquid fuels, and it was decided to make application for a Government grant in aid of this work. A discussion took place on the report made at the previous meeting by Mr. G. W. F. Horner on the breakdown which had occurred on a Diesel engine at Weymouth. At the next meeting of the Association, Mr. G. E. Windeler will explain a method of checking the alignment of shafts, and a means of proving whether a shaft is bedding in its bearings.

Help for Apprentices.—The *Times* states that considerable progress has been made with the scheme for assisting young men whose apprenticeship has been interrupted by service in the Forces. Schemes have been prepared by national joint industrial Councils and other bodies representative of employers and workpeople, and approved by the Minister of Labour, in the engineering, shipbuilding, ironfounding, electrical contracting, building, and many other trades.

The schemes all provide that an apprentice on reaching the age of 21 shall, for the first year, receive not less than three-fourths of the journeyman's rate (including war bonus), and for the second year not less than five-sixths. Towards this payment the State makes a grant of one-third of the journeyman's rate (including war bonus). Provision is also made for training in a technical institution. Full information and application forms may be obtained at any Employment Exchange.

Costs of Management in Small Undertakings.—Walsall Corporation has prepared the following comparative statement of the cost of remuneration of the staffs of 10 electricity supply undertakings (Walsall being No. 10) :—

Undertaking.	Units sold last completed year.	Technical staff including manager and all positions covered by E.P.E.A. award.		Accounting and clerical staff including store-keepers and meter readers.		Total staff excluding sales department.		Sales dept. staff.
		£ per ann.	Per unit sold.	£ per ann.	Per unit sold.	£ per ann.	Per unit sold.	£ per ann.
1	10,000,000	6,351	·153	3,909	·094	10,260	·246	516
2	9,554,210	4,516	·113	2,157	·054	6,673	·168	—
3	9,880,000	3,557	·086	1,670	·041	5,227	·127	571
4	10,217,551	3,164	·075	1,842½	·043	5,006	·120	319
5	6,118,788	3,016	·118	1,909	·075	4,925	·193	—
6	3,500,000	2,532	·174	1,621	·110	4,153	·285	—
7	4,080,069	2,194	·129	1,596	·094	3,790	·222	—
8	7,000,000	2,632	·090	926	·032	3,558	·122	—
9	10,833,341	2,137	·047	989	·022	3,126	·069	—
10	6,286,428	2,536	·097	1,574	·060	4,110	·157	237

Soldering Aluminium.—The *Revue générale de l'Electricité* discusses the uniting of pieces of aluminium by soldering or brazing. For soldering, the surfaces must be rubbed with emery paper with a small quantity of vaseline. The flux may be made up of lithium chloride, 15 per cent.; potassium chloride, 45 per cent.; sodium chloride, 30 per cent.; potassium fluoride, 7 per cent.; bisulphate of soda, 3 per cent. The joint should be carefully brushed and washed in hot water to remove all traces of the flux. For brazing, metals such as tin, bismuth and cadmium may be used. The process should, however, be used only in exceptional cases.

Institution and Lecture Notes.—Institution of Electrical Engineers.—The annual general meeting of the NORTH MIDLAND CENTRE was held at the Hotel Metropole, Leeds, on Tuesday, May 27th. Mr. R. H. Campion presided, and there was a good attendance. The statement of accounts was adopted, and the following officers were appointed for the ensuing session :—Chairman, Mr. W. M. Selvey; vice-chairmen, Messrs. W. E. Burnand and C. J. Jewell; committee, Messrs. C. N. Hefford, W. M. Rogerson, S. Simpson, W. B. Woodhouse, W. H. Brown, J. C. B. Ingleby, T. B. Johnson, T. Roles, J. H. Shaw, S. P. Barclay, S. E. Fedden; hon. sec., Mr. J. D. Bailie.

With regard to the time allowed to members for payment of subscriptions and the ceasing of giving notices of meetings, the following resolution was carried :—"That at the end of three months the local secretary should be first communicated with before cutting off the supplies to any member, and that a member should not then be struck off the list for another period of three months."

A discussion took place in reference to the desirability of increasing the number of members on the Committee. It was pointed out that Sheffield had been made a Sub-Centre of the North Midland Centre, and while they had a good representation on it, they would like power to increase the number on the Committee. More members on the Committee might make it of more interest to the general body of members.

Mr. Lang pointed out that Yorkshire was a very scattered area, and was different from a large industrial centre like Newcastle or Manchester, where the members were grouped very closely together. In his opinion, the North Midland Centre would be well advised to have a larger Committee.

Mr. Chaytor moved—"That this general meeting of the members of the North Midland Centre, in view of the creation of the Sheffield Sub-Centre, authorises the Committee, if they should think it desirable, to increase the numbers on the Committee, but not to exceed three more members." This was seconded by Mr. Blackburn (Huddersfield) and carried.

GAS *v.* ELECTRICITY.—The relative cost of gas and electricity in lighting and heating in relation to housing schemes was discussed by the British Association of Gas Managers, at a conference in Edinburgh last week. Mr. F. W. Goodenough, chairman of the Executive Committee, said there were three questions prominently before the public and in the Government programme to-day—housing, transport, and coal conservation. The public had very generally been led to believe, as the result of certain one-sided reports on coal conservation, that the panacea for all, or most, of the difficulties in regard to each of the three questions named was to be found in the general use of electricity. The most efficient generating station of to-day showed a loss of 88 per cent. The best result anticipated for the suggested super stations was an efficiency of only 18 per cent. Out of every 100 heat units in the coal carbonised at the "good practice" gasworks of to-day 77·5 were delivered to the community, and only 22·5 were lost. In the gasworks of the future it was possible that coal would be as completely as possible gasified, and that 75 heat units out of every 100 in the coal treated would be available for distribution as gas, against only 18 if the distribution was in the form of electrical energy. To use electricity as a fuel on any scale was, therefore, clearly out of the question from the point of view of the conservation of coal and its chemical constituents, as it was also from the point of view of cost. The facts were indisputable; but they had been unknown, overlooked, or ignored by those who, in the name of coal conservation, advocated the use of electricity for heating and cooking in connection with the great housing problem. In the fields of lighting and power electricity contended with gas on grounds unconnected with coal conservation, as its relatively high efficiency of conversion in those cases largely counterbalanced its relatively and positively high waste in generation. Under some conditions electricity would be preferred to gas for light or power, but where heat was required there could be no doubt that gas was preferable.

Mr. A. Masterton, engineer and manager, Edinburgh and Leith Corporations' Gas Commissioners, in a paper on Gas Equipment in Relation to Housing Schemes, said that, compared with electricity, gas was cheaper, more reliable, and cheaper in installation, when all the needs were considered from the first in the construction of the house.

The British Science Guild.—The annual meeting of the Guild was held on Tuesday last at the Goldsmiths' Hall, when the report of the year's work was submitted. An address on "Science and Labour" was delivered by the president, Lord Sydenham, G.C.S.I., and addresses were also given by Major-General Seely, Sir J. J. Thomson, and Sir Robert Hadfield.

The E.P.E.A.—A successful meeting was held at Dunfermline on Saturday last, with the view of forming a new Section to embrace Fife, Kinross, and Clackmannan, and to be called the Fife Section, with Dunfermline as centre. The following office bearers were appointed :—Chairman, Mr. R. K. Robertson, Cowdenbeath; vice-chairman, Mr. G. B. Jones, Dunfermline; secretary, Mr. D. Macdairmid, 166, Townhill Road, Dunfermline; treasurer, Mr. A. Webster, 6, Rose Crescent, Dunfermline.

Electrically-Operated Valve-Gear.—Mr. W. P. Durtnall writes with reference to a recent American patent for electrically-operated valves for internal-combustion engines, pointing out that this type of valve-gear was invented by him in 1909, and described in a paper read before the Institute of Marine Engineers in September, 1910, on the "Paragon" engine.

The Mind of Rathenau.—Dr. Walter Rathenau, "Jewish financial magnate," as the *Times* describes him, head of the A.E.G., as we know him, advocate of the most thorough preparations for another war which Germany must not start a year too soon, is now pouring abuse upon the political leaders who were not so quick as he to see that the German game was up, and that peace was the only card to play. The glib talkers who now advocate refusing to sign the Peace Treaty because it is still possible to resist, are told by him in *Die Zukunft* (as quoted by the *Times*) that this last illusion is the most stupid of all their wrong beliefs. He advises negotiation to the last moment, and signature if amelioration were obtained. Alternatively—what then? The German National Assembly dissolved, the president and all the German Ministers resigned, the enemies of Germany would take over the complete sovereign rights of Germany together with the responsibility of the Peace, the Government, and all the affairs of Germany. The progress of Rathenau during these years of war has been very interesting. It was in January, 1917, that he wrote in the *Lokal Anzeiger*, "We began the war a year too soon. . . . We must begin at once a reorganisation upon a broader and firmer basis than ever before"—we must calculate in advance—see what the country lacks, secure immense reserves of raw material to remain unused until a day in the future. . . . Every damned thing and every damned body must be ready next time upon the second day following a new declaration of war—these were the things that Rathenau was saying, perhaps in other words (see ELEC. REV., Dec. 27th, 1918, p. 639), even when he knew that a mistake had been made in beginning the war "a year too soon." What did he say in December, 1918? The great "Jewish financial magnate," head of the A.E.G., was "crying for mercy." Germany was "innocent" of wrong intentions! Well, the way to hell is paved with good ones, and there has been hell enough these years, Heaven knows! If the Entente Powers were to kill Germany in the name of justice, "we will bear our lot and perish upon the earth." That is precisely what we wanted to effect, to kill the Germany that longed for war, and if Dr. Walther Rathenau still believes in that Germany, and has lurking in his breast desires for preparing more thoroughly than ever before, the best thing that can happen to him is that he should, as he foretells, "perish upon the earth." The only other thought that we will give expression to here—and it always presents itself whenever we read the changing views of Rathenau—is this: Will the industrial organisation that he represents be permitted to win its way again into British Home and Colonial markets. How many British lives have been sacrificed through the materials, organisation, and efforts of Rathenau, and the productions of the A.E.G. works? How many innocent women and children have been bombed in British homes by aeroplanes made at their Berlin factories, or sunk by submarines equipped with apparatus therefrom? Everybody knows of these things, of course, but the truth must be said again and again, "Lest we Forget!"

Plight of the Russian Railways.—The Russian railway system, according to an article in the *D.A.Z.* (May 6th), threatens to collapse, owing to the fact that no repairs have been effected since the Revolution. The station buildings are for the most part deserted, the warehouses falling in, and the central switches and signalling apparatus no longer work, owing to the lack of spares with which to replace the worn-out parts. No modern electric or automatic signalling and loading apparatus exists on the Russian railways. The railway workshops were obliged to hand over important parts of their machinery to the munition workshops. This absence of necessary machinery and instruments is especially felt in the locomotive shops. The number of railway engines out of repair amounted in March, 1916, to 17·3 per cent.: March, 1917, 23 per cent.; March, 1918, 35·3 per cent.; March, 1919, 52·4 per cent.

The railway bridges and railway lines are also in a state of decay and have in some cases been badly damaged as a result of civil war. Little is heard in the Press of the numerous accidents that take place in consequence of trains running off the lines. The work of repair is often hindered by the passive resistance of railway workers antagonistic to the Soviet régime. For lack of raw material, the number of engines built in 1918 was considerably reduced. Since the taking of the Urals by Koltchak's Army, the production of pig-iron for rails has entirely ceased as far as the requirements of Soviet Russia are concerned and few new lines can be built.

The measures taken by the Soviet Government are too late to prevent the ruin of the Russian railway system. It is hoped, however, that the difficulty of transport will be lessened with the approach of the warmer weather, when the waterways will become available.

Inquiries.—Makers of electric immersion heaters are asked for.

Fatality.—At Hobart, Tasmania, in April, a boy aged 13 years, met his death through receiving a shock from overhead electric light wires. He and his companions were playing ball in the street, and the ball lodged in the wires of the transformer pole carrying a 3,000-v. cable. The boy climbed the pole to the platform near the top, and in trying to get the ball, he evidently caught hold of the wire and received a shock. One hand was severely burned.

The Association Scheme of the Society of Engineers (Inc.).—Recognising that association and co-operation are the order of the day, the Council of this Society has prepared a scheme for the Association of Engineering Societies.

We have received a copy of the printed regulations governing such Association. Any Engineering Society in the British Empire consisting wholly or in part of professional members may, at the discretion of the Council of the Society of Engineers, be admitted to association with the Society.

The Society will not be responsible for any acts which may be done, or for expenses or liabilities which may be incurred, by any Associated Society.

The Society has power to admit to membership, corporate or non-corporate, any duly-qualified member of any Associated Society, and shall in each year contribute to the Associated Society not more than one-fifth of the annual subscription paid to the Society by each member thereof, who at the date of his election to the Society is also a member of such Associated Society, for so long as he remains a member of the latter, provided always that, if any member of the Society at the date of his election thereto is a member of more than one Associated Society, the contribution shall be equally divided between the Associated Societies of which he is a member. All members of Associated Societies will be entitled to the following privileges:—(*a*) To attend the ordinary meetings, visits, and social functions of the Society; (*b*) to make use of the library and reading room of the Society; (*c*) to make use of the appointments and employment registers of the Society; (*d*) to compete for such premiums as may be awarded by the Society in open competition. Any member of an Associated Society on payment of 5s. per annum to the secretary of his Society, who shall transmit the same to the Society, shall be entitled to receive, post free, a copy of each issue of the *Journal* and *Transactions* of the Society as published.

Further particulars may be obtained from the Secretary at 17, Victoria Street, S.W.

Appointments Vacant.—Electrician-wireman, electrician armature winder, and gas engine attendant, for the Sheffield Corporation Water Department; overhead line foreman (90s.), for the Hull Corporation Tramways; repairs superintendent (£300 + 20 per cent. + £90), for the L.C.C. Tramways Generating Station; lecturer in practical mathematics (£150 to £240 + £39), for the Goldsmiths' College; resident electrical engineer (£300), and chief assistant engineer, for the Horsham U.D.C. Electricity Works; charge engineer (£305), for the Borough of Swansea Electricity Department; shift engineer (82s. 7d.), for the Eccles Corporation Electricity Works; second assistant mains engineer (350 taels per month, tael = 3s. average), assistant secretary, for the Electricity Department (400 taels per month), for the Shanghai Municipal Council. See our advertisement pages to-day.

Scott Transformer Connection.—According to Mr. E. Baticle, in the *Revue Générale de l'Electricité* of April 26th, the two transformers of a Scott connection operate under very different conditions. From the point of view of heating, it is therefore not permissible to load the system up to twice the rated load of each transformer. In fact, the load should not exceed three-quarters of this value. Furthermore, if the two-phase load is balanced, the heating of the two transformers will differ. Lastly, if the two-phase loads are unbalanced, the three-phase currents will be unbalanced also, and automatic cut-outs may not afford equal protection to each transformer.

Electric Furnaces in the States.—The production of electric steel castings in the U.S. rose from 8,551 gross tons in 1914 to about 92,000 tons in 1918. In the same period the output of electric steel ingots increased from 15,458 tons to about 325,000 tons. During the year 1918 nearly a hundred new electric furnaces were installed in the United States, increasing the total number in operation by 41.5 per cent. Nearly all these furnaces were designed for the production of either electric steel ingots or castings, there being only about 27 so-called special furnaces in the U.S. and in Canada at the end of the year. But it is to these special fields that attention will be turned now that the abnormal stimulus of the war has ceased. Considering the problem as a whole, the future technical development of the electric furnace may be expected to follow new and original lines, which will take it into virgin fields rather than further along paths marked out by war conditions.—*Iron Trades Review.*

Electrically-heated Boilers.—Under certain special circumstances the electrical heating of boilers is justifiable. The Allgemeine Elektricitäts Gesellschaft has developed special boilers, in which the heating is effected by the passage of electric currents through the water. For this purpose, narrow tubes of insulating material are provided. These contain water, and are vertically arranged so as to communicate with the interior of the boiler at the upper and lower ends of the tubes. Current is sent through the water columns contained in the tubes, and, as the resistance is great, considerable voltages are required. Alternating current must be used, and, in the case of three-phase currents, the tubes are connected in groups of three. The strength of the current is regulated by moving the electrodes in the tubes. The efficiency of the boilers is 95 per cent. and over, and 1 unit of electricity produces about 1.25 kg. of steam at 6 to 8 atmospheres. Up to the present electric steam generators have been built up to capacities of 1,500 KW. and at voltages up to 10,000 volts.—*Schweizerische Elektrotechnische Zeitschrift*, April 12th.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station and Tramway Officials.—The Darlington T.C. has advanced the salary of the tramway traffic superintendent, Mr. FRASER, from £180 to £200 a year, with a war bonus of £70.

Mr. D. J. GADSBY, assistant electrical engineer at the Hove Corporation Electricity Works, has resigned his position.

Swinton, Pendlebury, U.D.C. has increased the salary of the electrical engineer, Mr. H. C. BUSBRIDGE, to £330 a year.

The Keighley Tramways and Electricity Committee recommends the appointment of Mr. David E. BELL, of Pontefract, as assistant borough tramways and electrical engineer, at £286 per annum, rising to £300 after six months' satisfactory service.

Mr. H. R. HARPER, chief electrical engineer of the Melbourne City Council, has been appointed by the Victorian Electricity Commissioners chief engineer in connection with the development of Morwell brown coal deposits for the generation of electricity. The Commissioners have also appointed Mr. A. G. M. MITCHELL, M.C.E., to act as consulting hydraulic engineer and to obtain for the Commission data regarding water power possibilities. Mr. Harper's appointment is a permanent one, and the Commissioners expect that work will be commenced by the engineers immediately, as they have in view the preparation of a definite scheme for the establishment of a scheme for supplying electricity in bulk at an early date.

A breezy discussion took place at Sunderland Town Council last week on the Electricity Committee's report that they accepted with regret the resignation of the chief clerk, Mr. J. M. DONKIN. The acting chairman, Councillor R. J. Wilson, said that no reason had been given for the resignation, but Councillor R. Baxter asserted that there was a very powerful reason. He said Mr. Donkin had had no opportunity of being heard by the committee, and that it was a remarkable fact that with the departure of Mr. Donkin there was not now left a single member of the original staff. They had all been hounded out of the place. There was something wrong at the top, and the sooner there was an investigation the better. He moved that the committee's report be referred back. This was seconded, and after discussion carried by a large majority.

General.—The Appointments Department, Ministry of Labour, Norfolk Street, Strand, have recently appointed Major GORDON KENNARD, M.C.R.E., O.C. Signals (in the Expeditionary Force), to the 56th London Division to be their engineering investigation officer. Major Kennard was before the war for a number of years with the British Westinghouse Co., Ltd., and the Westinghouse Cooper Hewitt Co., Ltd.

It is stated in *Tenders* that Mr. R. CRESWELL, of the chief mechanical engineers' branch, N.S.W. railways and tramway department, and Mr. W. S. CORNER, of the chief electrical engineer's branch, are visiting America to investigate technical matters connected with the department, including the installation of electric furnaces for the production of electric steel.

Major S. UTTING, who recently returned from France, where he has been with the B.E.F. since September, 1914, has moved his offices to 82, Victoria Street, Westminster, S.W.1, where he will be interested in the Prat induced draught system.

Mr. T. WALLWORK, a member of the staff of the Blackburn electrical engineer, has been appointed on the Executive Council of the National Association of Local Government Officers.

Mr. E. E. SHARP and Mr. H. H. HOLMES, whose resignations from Chamberlain & Hookham, Ltd., and St. Marylebone Electricity Department respectively, we recently mentioned, are now joint managing directors of the Tok Manufacturing Co., Ltd., who are making rotary switches, as notified elsewhere in this issue.

Mr. E. SCOTT RIVETT, late assistant electrical engineer with the Rio Tinto Co., Spain, is now in England preparatory to taking up an agency for British firms in Spain. Mr. Scott Rivett, who has been acting for some little time as our correspondent in Spain, has a special knowledge of the present situation in that country.

Mr. A. H. HUMAN has resigned his position as chief technical adviser to the Electric Power Supply Department of the Ministry of Munitions, and is rejoining the firm of Merz & McLellan, consulting engineers, 32, Victoria Street, Westminster, to establish in conjunction with Mr. Robert Nelson (late H.M. Electrical Inspector of Mines) a new section of the firm to advise on the applications of electricity to manufacturing and engineering works and in mines.

Mr. M. L. COHEN, for many years with Messrs. Dorman & Smith, Ltd., Salford, has joined the staff of Mr. T. A. Nunwick, 4, Carr Street, Blackfriars, Manchester, as assistant representative.

Roll of Honour.—Trooper H. STOTT, Duke of Lancaster's Own Yeomanry, has died in France from injuries received in a railway acident whilst on his way home from Italy. He was previously employed in the office of Messrs. J. P. Hall & Co., Ltd., electrical engineers, Oldham.

Private (Acting Regimental Quartermaster-Sergeant) A. E. ALLISON, Labour Corps, who has been awarded the Meritorious Service Medal, was formerly in business as an electrical engineer at Doncaster as a member of the firm of Fisher & Allison.

Birthday Honours.—Company S/M S. G. MEADOWS, who was in the King's Birthday Honours List, receiving the award of the Meritorious Service Medal for service in Egypt, is on the staff of Callender's Cable and Construction Co., Ltd. He is shortly coming home.

Obituary.—SIGNOR PIRELLI.—We regret to read in Press dispatches from Milan that while laying telegraph cables in the Straits of Messina on Monday the cable steamer *Citta di Milano* foundered with the loss of 26 lives. Amongst those whose bodies have been recovered are Signor Pirelli, of Pirelli & Co., Milan, and Signor Brunelli, chief inspector of Italian Telegraphs.

MR. W. MCGEOCH.—Mr. William McGeoch, head of the firm of Messrs. William McGeoch & Sons, Ltd., wholesale ironmongers and electrical engineers, 28, West Campbell Street, Glasgow, died at Helensburgh on Thursday evening last week in his 78th year. Mr. McGeoch, who had been in indifferent health for some years, practically retired from active business over five years ago. Mr. and Mrs. McGeoch celebrated their golden wedding last year.

Will.—The late Dr. HENRY WILDE left £9,154.

NEW COMPANIES REGISTERED.

"Radiation."—Big Gas Stove Combine.—Radiation, Ltd., has been registered as a public company with a nominal capital of £2,750,000 in 1,350,000 preferred and 1,400,000 ordinary shares of £1 each. The preferred shares are entitled to a fixed cumulative preferential dividend at 6 per cent. per annum, and take priority in a winding up, both for arrears of dividend and return of capital, but carry no further rights in profits or assets. The principal objects are to acquire by purchase or otherwise all or any of the shares of John Wright & Eagle Range, Ltd., the Ridimond Gas Stove & Meter Co., Ltd., the Davis Gas Stove, Ltd., and any similar companies, and to carry on the business of manufacturers of and dealers in gas cooking and heating appliances, stoves, furnaces, and other apparatus employing gas, electricity, coal, coke, oil, or other fuels, manufacturers of and dealers in gas and electric appliances of all kinds, miners of fireclay and similar materials, &c. The papers are presented for filing by Mayo, Elder & Co., solicitors, 10, Drapers Gardens, E.C.2. The registered office is at 18, Bennett's Hill, Birmingham. The file number is 155,708.

South of Ireland Electric (Arc) Welding Co., Ltd. (4,717).—Private company. Registered in Ireland May 29th. Capital £2,000 in £1 shares. To carry on business as indicated by the title. The subscribers (each with one share) are: A. W. Spencer, 107, Cork Street, Dublin, engineer and contractor; P. Fay, 44, Surrey Street, Belfast, boiler maker and electric welder; R. D. Whyte, Sally Park, Clandalkin, Co. Dublin, director Irish Paper Mills. First directors: A. W. Spence, P. Fay, and R. D. Whyte. Registered office: 26, Upper Abbey Street, Dublin.

Halwains, Ltd. (155,794).—Private company. Registered June 5th. Capital £5,000 in £1 shares. Electric and steam engineers and contractors, manufacturers of tramway and other apparatus. The subscribers (each with one share) are: T. Halstead, Bent Gate House, Haslingden, cotton spinner; H. G. Wainscott, 9, Rochdale Road, Edenfield, near Manchester, electrical engineer; and Mrs. N. Wainscott. Directors: T. Halstead and H. G. Wainscott. Registered office: 44a, Bolton Street, Bury.

Engineering Industry, Ltd. (155,810).—Private company. Registered June 5th. Capital £5,000 in £1 shares. To acquire the periodical hitherto produced and published by the Electrical Times, Ltd., as "El Ingeniero Industrial" (in Spanish), and as "L'Ingenieur Industrtial" (in French), &c. The subscribers (each with one share) are: E. Slater, Weir Bank, E. Molesey, Surrey, engineer; J. May, 36, Victoria Street, S.W., consulting engineer; G. W. S. Hawes, 36, Victoria Street, S.W., consulting engineer; R. W. Hughman, Sardinia House, W.C.2, journalist. The directors are to be appointed by the subscribers. Registered office: Sardinia House, Kingsway, W.C.2.

W. Partington & Co., Ltd. (155,787)).—Private company. Registered June 5th. Capital £5,000 in £1 shares. To acquire the business carried on by W. W. Partington at Alpha Works, Taff's Well, Glamorgan, under similar style, and to carry on the business of electrical and mechanical engineers. The subscribers (each with 100 shares) are: H. O. King, 48, Park Place, Cardiff, shipowner; W. W. Partington, 180, Cathays Terrace, Cardiff, electrical engineer. The first directors are: H. O. Kine, W. W. Partington, and A. E. Davey. Registered office: Alpha Works, Taff's Well, Glamorgan.

W. E. Jackson & Co., Ltd. (155,860).—Private company. Registered June 6th. Capital £10,000 in 9,000 10 per cent. preference shares of £1 each and 20,000 deferred shares of 1s. Electrical and mechanical engineers, metal stampers, press tool makers, &c. The subscribers (each with one deferred share) are: H. H. Oxley, The Nest, King Edward Avenue, Dartford, mechanical engineer; W. E. Jackson, 48, Freer Road, Birchfields, Birmingham, press tool maker; W. R. Taylor, 59, Hampton Road, Birchfields, Birmingham, general engineer; G. C. Lawrence, 11, Brentgeerd Street, Bury St. Edmunds, marine engineer. Directors: H. H. Oxley, W. E. Jackson, W. R. Taylor, G. C. Lawrence. Registered office: 60-1, Blackfriars Road, S.E.1.

CITY NOTES.

Birmingham District Power & Traction Co., Ltd.

Mr. C. S. B. Hilton, speaking at the annual meeting on Monday, said that the net traffic receipts showed a fairly satisfactory increase. This would have been more marked but for the heavy increase in power and running expenses and repairs and maintenance. They had £66,000 to dispose of, as against £55,000 a year ago; the greater part of the increase was to be put to renewals and reserve. The conditions under

which they were carrying on were exceedingly difficult. Before the war the highest rate paid to motormen was 7d. per hour, with no bonus. The standard week worked was 60 hours, and the motorman's wages averaged about 35s. per week. The top rate was now 9¼d., plus 6¼d. bonus—a total of 15½d. The weekly earning for a 48-hour week was, therefore, three guineas. This showed an increase of 125 per cent. in the hourly rate of pay, or an increase of 80 per cent. in the weekly wage earned, notwithstanding a 20 per cent. reduction in the working hours. On the assumption that the car hours worked in 1919 would be the same as those worked in 1918, and on the basis of the wages paid for the month of April, 1919 (the first period in which the shortened working week took effect), the wages bill for the year 1919 would exceed that for 1918 by £38,000. To this should be added the extra cost of materials, estimated at £17,000, so that the expenses for 1919 might be estimated at £50,000 in excess of those for 1918. This would give a total for expenses of £245,000, leaving a net result of £108,000, to compare with £142,000 for 1918, or £34,000 less, but £36,000 more than for 1914. The engineering, traffic, and clerical wages of the operating staff, excluding all reconstruction expenditure, amounted in 1914 to 2s. 0¼d. per car hour. In 1918 they were 3s. 6d¼., while in 1919 they had risen to 4s. 10½d. The cost of labour per car hour was, therefore, 37½ per cent. more this year than last year, or 139 per cent. more in 1919 than in 1914.

Siemens Bros & Co., Ltd.

The annual meeting was held on June 12th, at Winchester House, E.C., Mr. G. Mure Ritchie presiding. In proposing the adoption of the report, which is summarised below, the chairman referred first to the balance sheet, and said there was a new item, £830,000, being debentures issued and deposited with the Public Trustee as collateral security as part of the financial arrangements which they had made with that department. If not previously paid off, that item would be reduced to £500,000 in the next balance sheet. The item of £1,326,495, due to the Public Trustee, but subsequently reduced to £500,000, was also new, and included debts incurred for capital purposes to the former enemy holders of the company's shares. Of that £1,326,495, about £690,000 was owing by Siemens Bros. Dynamo Works, Ltd., and was assured by Siemens Bros. against the receipt of an equivalent amount of 4½ per cent. debenture stock of the Dynamo Co., which appeared on the credit side of the balance sheet. They, of course, had had no dealings with the former enemy shareholders, nor any responsibilities to them. They bought the business and its assets from the Public Trustee at a fair price in competition with other tenders, and had nothing to do with the disposal by him of the price. The general reserve fund stood at £45,000, and they recommended the appropriation of £15,000 from the year's profits, raising the fund to £60,000. Buildings reserve fund at £30,000 was up by £5,000, also appropriated from the year's profits. After making the various deductions, including depreciation, set forth in the profit and loss account, but excluding the proposed appropriation of £15,000 to reserves, the profit was £334,567, as against £269,890 in 1917. On the asset side of the balance sheet, the item of leasehold buildings at Woolwich had been augmented by £11,423. Materials, manufactured goods, and work in hand had, owing to still larger demands for munitions by the Government in 1918, gone up from £764,524 to £982,587; machinery, tools, and furniture had risen from £151,425 to £156,096, but the steamship *Faraday* remained as before at the very low figure of £18,000. The proposed disposal of the balance at the credit of profit and loss account—£334,567, was fully set out in the report, and after providing a dividend of 10 per cent., free of income tax on the £600,000 entitled to rank for 1918, they carried forward a balance of £244,567 to 1919, subject to excess profits duty. Though in 1918 the volume of the company's output had largely increased, and its value had increased by about 50 per cent., the net profit only increased by about 10 per cent., the additional gross profit having been absorbed chiefly in increased war bonuses, salaries, and wages. The new board took office on April 8th, 1918, and there were now 2,000 names on the share register; of debenture holders there were about 1,200. Having referred to the fact that in 1918 they distributed £11,700 in assisting the families of employés serving in the Army and the Navy, and stated that out of 1,154 men who joined the Forces they had had the pleasure of welcoming back so far 625, the chairman proceeded to refer at some length to the manufacturing work of the company during the past year. He said that at their works at Woolwich until the Armistice they continued to concentrate their operations almost entirely on special and urgent Government work. The apparatus and telephone factory was occupied almost entirely on producing war materials for the Government and electrical apparatus required in connection with the equipment of factories producing war work, such as the automatic telephone exchanges for factories. The requirements of the Air Board gave them a steady continuous production of aircraft magnetos. Repeat orders for Fullerphones and gun-aiming points kept shops employed on the same work with which workers and foremen had become acquainted during the former year. They made for the Ministry of Munitions large quantities of 120 cm. anti-aircraft searchlights, amplifiers for telegraph work, and Morse inkers. For the Admiralty and for shipyards under Government control they maintained a steady supply of torsion meters. As, however, the Government requirements for their apparatus and telephone department were almost wholly for articles to suit the special war conditions, and were quite different from their ordinary pre-war output and post-war requirements, the change-over to normal output could only be made with considerable difficulty, as suitable raw materials were not available in their stores, while many new foremen and workers had not yet got adequate experience of the work which they were now called upon to perform. An order for an automatic telephone exchange for Valparaiso was placed with them for execution as and when war conditions permitted. They much regretted that owing to the unrest of labour, which was more pronounced in 1918 than in former years, and owing to the restriction of output by the workers and their indifference, production in that department was greatly retarded. As very few orders were placed by the Post Office during the war for telephone exchanges, and as foreign administrations were unable to obtain supplies of telegraph instruments for nearly five years, large demands had to be filled, and they expected to get a good share of the work, to cope with the expected large volume of which adequate arrangements were now being made. During 1918 the battery department extensions were completed, affording the greatly increased facilities for production required by the Government, but on the armistice production was considerably curtailed. Throughout 1918 the india-rubber department was kept fully occupied on the production of field cables, effecting deliveries in continually increasing quantities to a maximum of 2,000 miles per week. That production of course had now ceased. Trench cable of the heavy armoured, four-core type was manufactured during 1918, the output constituting a continuous supply of 80 miles per week; a production likewise stopped soon after the armistice. The Government's demands for submarine cable, principally of the telephone type, coil loaded, necessitated continuous production during 1918. In that speciality they were now the largest and premier manufacturers. The wood work carried out was far in excess of any previous years, the demands emanating from the Ministry of Munitions, and the Office of Works, for military and office requirements. Ebonite was formerly a flourishing industry in this country, but partly because makers restricted themselves to the more profitable branches and partly because the workmen would not maintain an output equal to his Continental competitor, the industry here practically became extinct. Since the war, however, they had devoted particular attention to that production, and they were now manufacturing it in increasing quantities, and of a high quality, which compared favourably with the ebonite previously imported from Germany, from which most of the high-grade quality came. With regard to the s.s. *Faraday*, during part of 1918 she was chartered to the Western Union and the Direct United States Cable Co., and did much work under trying conditions. Since the end of last year the vessel had again been chartered, and at the present time she was doing cable repair work in the Atlantic. Having referred to the Dalston lamp works, where with their increased capacity for production he said they hoped to turn out lamps in greater volume at a substantial profit, the chairman referred to the dynamo works of Siemens Bros., about a mile south of Stafford station. Those works, he said, were not occupied to the same extent as Woolwich on work contracted directly to the Government, but during 1918, as in previous years, they concentrated on important contracts, practically all of which were directly or indirectly helpful to enable the nation to secure victory by providing other firms with plant. In the circumstances, the change-over from war to peace conditions had been more easily effected at Stafford, and he was pleased to say that those works were well employed, and had a large order book. Following on the armistice came extensive cancellations of Government contracts, and in regard to the settlement of those matters, though they had not got all that they thought they might fairly claim, yet, speaking broadly, there had been nothing about which they could complain. Whatever loss might be incurred during the period of transition they must cheerfully face, hoping by energy and enterprise to make up for it later. Before the war they were, under the conditions then existing, too insular in their policy; now, as a purely British industrial concern, they aspired to a substantial share of that world-wide expansion which great firms sought. With the approval of the British authorities, last year, they dispatched on a tour round the world two gentlemen of standing and experience—Messrs. Hopkins and Leonard, the latter being an old official of the company. They did not charge them to book orders, but they were instructed to make it plain, and they had done so, that the ownership of Siemens Bros., and of the Dynamo Co. had passed from the hands of a German company into those of a British company, and that while continuing to carry on the traditions of sound material and good workmanship long associated with Woolwich and Stafford, they were no longer under German influence or working for German interests. As to the prospects for the future, subject always to honest and sane government and a reasonable attitude on the part of the workmen, he considered, generally speaking, their prospects were good. There were, however, various dangers ahead, one of which he would mention. If in Britain we were to have not nationalisation of the mines, but appropriation for their own selfish aggrandisement by one powerful but limited class of workmen, to the detriment of the rest of the community, we should plunge into industrial suicide. If the mines were put under dual control, the ultimate result would not be very different, as it would mean industrial creeping paralysis, ending also in industrial death.

Did those things come about they could not but be seriously prejudiced, though in their particular lines of business the evil effect would be neither so early, nor so pronounced, as in other manufactures, such as iron and steel, for example, where fuel was consumed to a greater extent. However, he was not a pessimist. On the whole, he regarded the political economic future with hope, if not with confidence, believing that British common sense would sooner or later assert itself, and that there was sufficient sanity in the country to prevent their being plunged into industrial chaos, and that no section of workers, however highly organised, could indefinitely seize the community by the throat and hold it up to blackmail. Subject to those observations he preferred to close on a note of optimism—he hoped temperate and reasonable optimism—in regard to the expansion of the business; and thought that on the whole, year in and year out, they might expect that adequate profits would accrue.

Lord Queenborough seconded the motion, which was carried unanimously.

Subsequently an extraordinary meeting was held at which a resolution was passed dividing the existing £5 shares of the company into five shares of £1 each, so that the capital would henceforth be £1,500,000 divided into 1,500,000 shares of £1 each, of which 1,000,000 have been issued and fully paid; and the remaining 500,000 shares are unissued.

Delhi Electric Tramways & Lighting Co., Ltd.

In the report for the year ended December 31st, 1918, the directors state that the company was called upon by the Government for an increased output of war materials from the beginning of the year, and had to make further extensions to its rubber and battery shops for the purpose. More workpeople were employed, and manufacture was carried on at high pressure until the armistice when work eased down, and output on Government contracts was gradually reduced preparatory to the return to civil work, for which preparations were at once made. The company's steamer *Faraday*, under the direction of the Admiralty, was engaged during the year in repairing telegraph cables for two of the Atlantic cable companies, and although working in the danger zone, escaped mishap. The amount spent during the year in assisting the families of employés who had been called up for the Navy and Army was £6,616 by this company and £5,155 by Siemens Bros. Dynamo Works, Ltd. These payments had had the effect of strengthening the good relations between the company and the men, who as they are being demobilised are returning, thus securing to the company trained men for the future. The authorised share capital was increased in July, 1918, from £600,000 to £1,500,000. Of this increase £400,000 was issued in November, making the fully paid-up capital now £1,000,000. At the same time £500,000 4½ per cent. debenture stock was sold. Since the end of the year the proceeds of the shares and debentures issued had been applied in reduction of the capital sum owing to the Public Trustee, which now stands at £500,000. The profit for the year per profit and loss account is £229,647, plus £134,920 brought forward. The interim dividend of 5s. per share required £30,000 and 5s. per share, free of tax, on the £600,000 capital absorbs a further £30,000; there is written off the commission on the sale of shares £20,000; written off discount on the sale of debenture stock, reducing it to £62,500, £25,000; put to general reserve (bringing it up to £60,000) £15,000; there is carried forward to 1919 (subject to excess profits duty for 1918) £244,567.

Mr. A. W. Tait, C.B.E., presided at the annual meeting on June 13th. He said that the results were satisfactory, considering the abnormal conditions. The progress of the past five years was decidedly encouraging, and he hoped it would continue. They were now able to recommend the full 6 per cent. upon the preferred shares for the first time in their history. The net revenue increase for the year was £2,890, and for the five years £11,800, or 190 per cent. The costs of operation and maintenance had been affected by the higher prices of material and labour, and by difficulties in securing spare parts from this country. The revenue continued to reflect the prosperity which had ruled in India for some time, but expansion of business was retarded by the necessity of shutting down on new consumers owing to inability to obtain cables and materials for connections. Now that the restrictions had been removed, orders had been placed for the necessary cables and materials. Rates to consumers had only been increased by a small percentage—considerably less than the actual increase in cost, but they kept the surcharge low in order to encourage the use of electricity. It might be necessary at some future date to issue further capital to a moderate extent to deal with extensions of the electricity undertaking and of the tramway system; for the latter they would supply cars of a new type, adapted to meet the requirements of the service. Mr. Griffin, the general manager, was at present home on leave. The electricity supply undertaking sold 1,970,000 units (increase 6 per cent), including the tramway requirements. Average revenue per unit sold (excluding the tramway supply) 4.70d., as against 4.24d. Units sold for other than tramway supply 1,465,000. Costs of generation .96d., against .92d. per unit, due to increased charges for coal and oil fuel. The new Sulzer engine coupled temporarily to an old dynamo gave a much needed increase of capacity of 150 KW. A new dynamo had been ordered which would give an additional 80 KW. The gross revenue from the tramways increased by 11 per cent., and the receipts per passenger from .43d. to .49d. Receipts per car mile were 8.5d., against 6.9d. Passengers carried 7,204,000, against 7,480,000. The travelling habit had become established with the native population, and if they could maintain an increased service the capital in the tramways would yield a proper return. In regard to the prospects for the current year, it was impossible to give reliable estimates, as oil fuel and stores and spares still showed an upward tendency. Provided nothing unforeseen occurred, the results for 1919 should show an improvement on those now submitted.

The General Electric Co. (U.S.A.).

The report of this company dated Schenectady, April 15th, 1919, states that the value of the orders received during 1918 was £46,826,807, against £49,355,698 in 1917. A considerable part consisted of contracts for the U.S. Navy Department. As the result of heavy expenditure incurred upon additional manufacturing facilities to meet war contracts, the rate of production had reached the highest point in the company's history when the armistice was signed in November. The cessation of hostilities led to the suspension and cancellation of orders for £6,000,000, leaving approximately £16,000,000 of unfilled orders at the end of the year. Sales billed £43,363,055, an increase of £3,977,791. Net result: profit £5,675,151, plus £921,263 income from other sources. Interest on debentures and notes payable £475,417. Federal income and excess profits taxes (estimated) £2,700,000; dividends £1,833,124, leaving £1,587,873 as surplus for the year. Expenditure for additional land, buildings, machinery, and other equipment aggregated £4,318,799. As a portion of these recent additions will be unused, and having regard to their high cost owing to the circumstances under which they were built, £3,044,832 has been written off the plant account, and £637,358 will be included in the cost of unfinished contracts. £383,740 was charged against the general plant reserve, leaving an increase of £1,020,348 in the book value of plant and equipment. The totals are thus: Gross book value, £15,998,157; general plant reserve, £7,180,127; net book value, £8,808,030. The book value of the manufacturing plants which in January 1893 was £791,705 was at December, 1918, £8,808,031, after £18,493,633 had been written off or carried to general plant reserve during the 26 years. The total factory floor space increased from 17,573,000 sq. ft. in 1917 to 19,581,000 at the end of 1918. In order to provide additional facilities for the manufacture of incandescent lamps the company has leased the Sandusky works of the Libbey Glass Co., with contract to purchase. The patent account is, as before, carried at a net value of one dollar, that proportion of the actual cost which represents the unexpired life of patents and franchises being offset by a reserve of like amount. The report mentions that at the close of the year, after careful consideration, the board decided that the interests of the company would best be served by segregating its investments and activities in foreign countries in manufacturing, selling, engineering, and utility enterprises, and transferring them to a separate company—the International General Electric Co., Inc., organised in January, 1919—which will at once take over the investments and conduct the activities above described in all foreign fields. Mr. C. Neave, of the G.E.C. legal staff, becomes chairman of the new company; Mr. G. Swope, formerly vice-president of the Western Electric Co., is president, and Mr. M. A. Oudin, for many years manager of the foreign department of the General Electric Co., is vice-president. The offices of the new company are at 120, Broadway, New York City. Of the 8,421 employés of the G.E. Co. who joined the Forces, 1,880 had returned and been reinstated when the report was issued.

Marconi International Marine Communication Co., Ltd.

During 1918 the business continued to show substantial expansion. Gross revenue £563,205, an increase of £92,547, again mainly derived from rentals of additional ships fitted. The restrictions on private messages from ships at sea had only been removed since May 1st, 1919. The net profit for 1918 is £186,342. Last year shareholders were advised that H.M. Government had decided to make the provision of wireless telegraph apparatus compulsory on merchant ships of 1,600 tons gross and over, and to require that two operators be carried on all these vessels. At the request of the Board of Trade, this company undertook to provide the necessary apparatus and the trained operators. It, therefore, became necessary to arrange facilities in all parts of the country for the simultaneous training at the company's expense of a very large number of operators. Thereby a large and extraordinary expenditure has been incurred during the year under review which will not recur, and it is responsible for a small reduction in the profits compared with the preceding year notwithstanding the substantial increase in the year's revenue. The losses sustained in consequence of attacks upon the mercantile marine during 1918 have been debited to profit and loss. The directors recommend a final dividend of 10 per cent. for 1918, making 15 per cent. for the year. The total number of public telegraph stations owned and worked by the company on the high seas increased from 2.265 to 2.549. The organisation of the company, together with that of its associated companies, with a total of over 4,000 mercantile vessels fitted with Marconi telegraph stations, has continued to render inestimable service. The Amalgamated Wireless (Australasia), Ltd., in which this company is interested, has paid a dividend of

5 per cent. for the year ended June 30th, 1918. The increase of the capital of the company to £1,500,000 was duly confirmed at the extraordinary general meeting, held on May 2nd, 1919, and 600,000 new shares were offered to the shareholders, at par, on May 10th. An official quotation on the London Stock Exchange was granted for the company's shares in April last. Further members of the company's telegraph staff have lost their lives in the services of their country. The directors record the death, on May 9th, of Mr. H. S. Saunders, who had been a director of the company since its incorporation. Mr. S. St. J. Steadman and Sir C. J. Stewart, K.B.E., have been appointed directors.

Marconi Wireless Telegraph Co., of Canada.—Shareholders of this company will be invited at the approaching general meeting to agree to the reduction of the nominal value of their shares from $5 to $2.50, and to the creation of 500,000 additional shares of $2.50 each. By this arrangement the total nominal capital of the company will be reduced to $3,750,000; the company will be entirely clear of its heavy liabilities; will be provided with substantial working capital, and enter into possession of a second high-power wireless station, which will enable it to open up additional telegraph service.

Mr. Arthur H. Morse has been appointed managing director of the company, and will proceed immediately to Canada to take up his duties.

Calcutta Electric Supply Corporation, Ltd.—The number of units sold to consumers during the four weeks ended April 25th amounted to 2,587,915, compared with 2,509,519 last year.

Stock Exchange Notices.—Applications have been made to the Committee to allow the following to be quoted in the Official List:—

Smith (S.) & Sons (Motor Accessories), Ltd.—150,000 ordinary shares of £1 each, fully-paid.

Vickers, Ltd.—1,844,351 ordinary shares of £1 each, fully-paid.

Barnsley & District Electric Traction Co., Ltd.—This company is about to change its name to the Barnsley and District Traction Co., Ltd., and to divide its £5 shares up into £1 shares. It will also alter the 6 per cent. cumulative preference to 7 per cent. non-cumulative shares, and 50,000 new shares of £1 each will be added to the capital.

Manila Electric Railroad & Lighting Corporation.—The directors announce a dividend of 1½ per cent. on the common capital stock for the quarter ending June 30th.

James Keith & Blackman Co., Ltd.—The report for the year ended March 31st, 1919, states that after providing for debenture interest, excess profits duty, and making sufficient allowance for depreciation and reserves against doubtful debts, the accounts show a net profit of £36,898. The balance brought forward is £13,266. Preference dividends paid, £2,112, leaving a balance of £48,052. Dividend on the ordinary shares at the rate of 10 per cent. and a bonus of 10 per cent., both free of income-tax, absorbing £16,000, transfer to reserve account £15,000, and carry forward £17,062.—*Financial Times.*

Vulcan Boiler & General Insurance Co., Ltd.—Interim dividend 9 per cent. (4s. 6d. per share), less income tax.

Mackay Companies.—Dividend of 1½ per cent., less income tax, on the common stock.

Mirrlees Bickerton & Day, Ltd.—Year ended March 31st, 1919, net profit, after providing for depreciation and excess profits duty, £33,177. £2,120 brought forward. Dividend 12½ per cent., free of income tax, on the ordinary shares; to reserve fund £5,000; carry forward £5,720.

United River Plate Telephone Co., Ltd.—The gross earnings during the year ended December, 1918, were £908,870, while the gross maintenance and other charges in Argentina and London were £616,370, leaving £292,500 profit, plus £17,308 brought forward. Debenture interest and preference dividend are paid and dividends (including 5 per cent. final) on the ordinary amount to a total of 8 per cent., free of tax. There is put to reserve £60,000, to reserve (war contingencies) £60,000, and £36,707 is to be carried forward. Sir John Gavey has found it necessary to resign the chairmanship, and Sir Frederick Green has been appointed in his place. Sir John has been elected as deputy chairman.

Cork Electric Tramways & Lighting Co., Ltd.—The report shows that, after paying the preference dividend, putting £6,500 to reserve for depreciation and renewals, £4,000 to maintenance reserve, and writing £396 off wiring consumers' premises, and including £3,776 brought forward there is a credit balance of £3,649, which is to be carried forward.

Ruston & Hornsby's, Ltd.—After paying dividend of 8 per cent. for the year, £40,697 is to be put to depreciation, £40,000 to reserve, and £41,000 is to be carried forward.

Yorkshire (Woollen District) Electric Tramways Co., Ltd.—The report for 1918 shows that the revenue was £102,562, an increase of £17,977. £19,800 is put to renewals. The dividend on the ordinary shares is to be 6 per cent. for the year. In addition a further £10,001 is to be applied to raising the dividend for the years from 1914-1918 from 5 per cent. to 6 per cent. average. £1,978 is to be carried forward.

Calcutta Tramways Co., Ltd.—Sir H. Kimber presided at the annual meeting on June 16th. He said that the traffic receipts showed an increase of £24,803, or about 10 per cent. This was comparing with the excellent figures of the previous year. The increase on mileage run was only 1 per cent. The other receipts were £14,962, chiefly a profit on exchange of £14,128. The total Indian working expenses were £8,062 more than in the previous year, and £5,637 of that amount represented a bonus of one month's salaries and wages paid to the Calcutta staff to meet increased cost of living, &c. There was a gross profit of £151,124 over all working expenses. The traffic receipts continued to show substantial improvement. During the past five months the traffic receipts increased by Rs. 2,55,172, and the mileage run by 25 per cent., while the rate of exchange still continued largely in their favour. They had ordered 15 new trams. They were now obtaining better deliveries of materials for repairs and renewals.

Petters, Ltd.—After paying the preference interest a dividend of 10 per cent. and a bonus of 2s. per share are to be paid on the ordinary shares, putting £50,000 to reserve, and carrying forward £16,993.

Shropshire, Worcestershire & Staffordshire Electric Power Co.—Net receipts for 1918 from all sources £88,063. After deducting expenses and interest on loan, £20,000 is put to reserve, including sinking fund, 6 per cent. is to be paid on the ordinary shares, and £8,136 is to be carried forward. An issue of £150,000 cumulative preferrence shares (6 per cent.) will be made to discharge capital liabilities and to provide additional capital.

Nairobi Electric Power & Lighting Co., Ltd.—Final dividend at the rate of 2 per cent. for the year 1918, less tax.

STOCKS AND SHARES.

TUESDAY EVENING.

Now that the Victory Bonds are out the effect is not much greater upon Stock Exchange business than was produced by the anticipation of their advent. Certainly business in the investment markets is quiet, but, also certainly, this is a state of affairs which is not unusual in June. Brokers are being asked whether they find much selling of existing securities on behalf of people who want to apply for the new bonds, and the reply on the whole is in the negative. A good many prices have been marked down to the tune of a point or so amongst gilt-edged stocks, while in the markets for first-class industrial debentures and preference descriptions there is an obvious slackening of demand. But prices on the whole are comparatively little influenced by the bonds, and it is regarded in the Stock Exchange as astonishing that a loan of such magnitude can be floated at the cost of so trifling a disturbance to other markets.

For the second week in succession there is no change to record in the price-list of London electric supply companies' shares. It may be that the month will go by and leave the list untouched. This is not to say, however, that there is no interest taken in the market. In point of fact, keen attention is being paid to the prospects of the industry as they open up under the Government Bill. We have already hinted that one of the effects of the Bill may easily be a prolongation of the companies' leases of life, and this impression becomes stronger amongst those who are in close touch with the workings of the business. At any rate, the Government Bill, instead of being regarded as a bear point, and one which justified the putting down of prices three weeks ago, is now held to carry germs of hopeful possibilities which may result in the position of proprietors being bettered instead of worsened.

Cable securities have given way in several cases, owing to the general wish to subscribe to the new bonds. Eastern Extensions are down 5s., Eastern Ordinary 3 points and Western Telegraphs 2s. 6d., while in the telephone shares, Orientals and United River Plates are both 1/16 lower. Globes fell back to 16. It is easy enough to understand that holders of these stocks should consider it patriotic to sell them in order to buy the new bonds, seeing that the return on the latter looks much about the same as that on the cable shares, although it is easy to forget that the dividends on the cable companies' shares are distributed free of tax, which makes a very considerable difference in these days of a 6s. in the £ impost. The same influence is at work amongst certain of the good foreign tramway bonds, and some which, until lately had been extremely difficult to buy, are now obtainable at more reasonable figures.

The Marconi market has developed renewed animation under the leadership of Canadians. Shareholders of the Canadian Marconi Company are asked to agree to the cutting in half of the nominal value of the shares—making them 2½ dollar, instead of 5 dollar shares—and to the creation of half a million additional shares of the new denomination. This is read as a clear sign of forthcoming bonus, and the price rose from 16s. to 18s. 9d. before a slight reaction took place. The Marconi International Marine Company's report shows a gross revenue for the year of £563,200, an increase of £92,500 over the previous twelvemonth, but large and extraordinary expenditure, of the non-recurring kind, was involved by the training of a "very large number of operators," and the net profits accordingly show a small reduction. A dividend of 10 per cent., making 15 per cent. for the

year, is declared, the same as that for 1917. The price has remained steady at 3 9/16, while the parent shares are 6 3/16 and American Marconis a shade better at 30s.

Brazilian Tractions have fallen back to 60, and the foreign list as a whole is dull. The news that American troops have crossed the Mexican frontier, and that General Villa is again displaying unhealthy activity, has had the effect of making Mexicans weaker. Mexico Trams and Mexican Light and Power bonds have both eased off. Anglo-Argentine Tramways First Preference are also lower again. Bombay Electric Second Debentures at 86¼ show a rise of 3, and the Preference shares hold their price at 11¾.

Underground Electric Income Bonds went back to 95¼. Amongst this week's letters of a stockbroker was one from a client asking whether the latter could "convert" his Underground Electrics into the new Victory Bonds! The shilling shares have weakened to half-a-guinea, and Home Railway stocks are generally heavy.

British Westinghouse Preference have recovered all their dividend and a little more, the market being extremely hard. Babcock & Wilcox, after giving way to 3 13/16, recovered to 3 15/16, which still leaves them a little lower on the week. General Electric Ordinary have risen 10s. to 22. India Rubber shares have resumed their advance, and are now 17¾. Henleys hardened to 2¾. English Electrics are dullish at 27s. 6d., and other shares in this group are quiet. The rubber market has been flat in consequence of a drop to 1s. 8¼d. per lb. in the price of the raw material, though a slight recovery in prices ensued upon a farthing rally in rubber. Iron, coal and steel shares are somewhat under the influence of what possibilities may be held in the forthcoming report of the Coal Commission. Industrials as a whole maintain their prices with a good deal of strength.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1917.	Dividend 1918.	Price June 17, 1919.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES					
Brompton Ordinary	10	8	6¾	—	£5 8 10
Charing Cross Ordinary	4	4	8½	—	6 8 1
do. do. 4½ Pref.	4½	4½	8½	—	6 18 4
Chelsea	5	8	8½	—	4 2 9
City of London	8	8	11½	—	6 14 6
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
County of London	7	7	10½	—	6 18 3
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
Kensington Ordinary	7	6	8½	—	5 4
London Electric	Nil	Nil	1¾	—	Nil
do. do. 6 per cent. Pref.	6	6	8½	—	7 14 10
Metropolitan	4	6	8½	—	8 0 0
do. 4½ per cent. Pref.	4½	4½	8½	—	6 18 8
St. James' and Pall Mall	9	10	7½	—	7 0 4
South London	5	5	2¾	—	7 5 6
South Metropolitan Pref.	7	7	20/6	—	6 16 7
Westminster Ordinary	9	8	6¼	—	6 10 8
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	100	—	6 0 0
do. Def.	1½	33/6	22½	—	7 8 0
Chile Telephone	8	8	7	—	5 14 4
Cuba Sub. Ord.	7	7	11	—	*6 4 5
Eastern Extension	8	8	16½	— ¼	*4 17 9
Eastern Tel. Ord.	8	8	184	—2	*4 17 3
Globe Tel. and T. Ord.	7	8	16	— ½	*5 0 0
do. do. Pref.	6	6	108	—	5 13 0
Great Northern Tel.	29	29	82	—	6 17 6
Indo-European	13	13	55	—	5 18 2
Marconi	20	20	6	— ¼	3 4 6
Oriental Telephone Ord.	10	15	9½	— ⅛	6 9 0
United R. Plate Tel.	8	8	8½	— ⅛	*4 18 6
West India and Panama	1/8	1/8	1	—	*4 6 4
Western Telegraph	8	8	17	—¼	*4 14 2
HOME RAILS.					
Central London Ord. Assented	4	4	63½	—	6 6 6
Metropolitan	1	1½	26	—	4 16 4
do. District	Nil	Nil	24½	—	Nil
Underground Electric Ordinary	Nil	Nil	9¾	—	Nil
do. do. "A"	Nil	Nil	10/6	—3d.	Nil
do. do. Income	4	5	95½	— ½	*5 4 9
FOREIGN TRAMS, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	42	—	5 11 4
Anglo-Arg. Trams. First Pref.	5½	Nil	3½	—¼	—
do. do. 2nd Pref.	—	—	8½	—	—
do. do. 5 Deb.	5	5	69½	—	7 8 5
Brazil Tractions	—	—	60	—1	—
Bombay Electric Pref.	6	6	112	—	5 11 7
British Columbia Elec. Rly. Pfce.	5	5	64½	—1	7 18 6
do. do. Preferred	Nil	2½	48½	+1	5 3 1
do. do. Deferred	Nil	Nil	44½	+1	Nil
do. do. Deb.	4½	4½	61½	— ½	6 17 10
Mexico Trams 5 per cent. Bonds	Nil	Nil	62½	—	Nil
do. 6 per cent. Bonds	Nil	Nil	58½	—1	Nil
Mexican Light Common	Nil	Nil	37	—	Nil
do. Pref.	Nil	Nil	51	—	Nil
do. 1st Bonds	Nil	Nil	67	—2	—
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	3¹⁵⁄₁₆	—1/16	3 16 0
British Aluminium Ord.	10	10	1½	—	5 18 6
British Insulated Ord.	25	12½	2⅜	+1/16	5 11 1
British Westinghouse Pref.	7½	8	2¹⁵⁄₁₆ xd.	+1/16	5 11 1
Callenders	25	25	10½	—	6 3 0
do. 6½ Pref.	5	6½	3⅛	—	6 8 10
Castner-Kellner	25	20	3	—	6 18 4
Edison-Swan, "A"	—	—	1½	—	6 0 0
do. do. 5 per cent. Deb.	4	5	75½	—	6 12 3
Electric Construction	10	10	1½ xd.	—	8 0 0
Gen. Elec. Pref.	6	6½	10½	—	6 3 10
do. Ord.	10	10	22	+½	*4 11 0
Henley	25	25	2¾	—	8 2 6
do. 4½ Pref.	4½	4½	8¾	—	6 0 6
India-Rubber	15	15	17¾	+¼	*5 13 8
Siemens Ord.	—	10	6⅛	—	*7 4 0
Telegraph Con	20	20	25½	—	4 18 6

*Dividends paid free of Income Tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, June 18th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/5	..
a Ammoniac Sal	per ton	£80	..
a Ammonia, Muriate (large crystal)	"	£78	..
a Bisulphide of Carbon	"	..	..
a Borax	"	£29	..
a Copper Sulphate	"	£44	£2 inc.
a Potash, Chlorate	per lb.	1/3	..
a " Perchlorate	"	1/6	..
a Shellac	per cwt.	£17	10/- inc.
a Sulphate of Magnesia	per ton	£15	..
a Sulphur, Sublimed Flowers	"	£28	..
a " Lump	"	£20	..
a Soda, Chlorate	per lb.	9d.	1d. dec.
a " Crystals	per ton	£10/-	..
a Sodium Bichromate, casks	per lb.	..	..
METALS, &c.			
c Brass (rolled metal 3" to 12" basis)	per lb.	11½d.	..
c " Tubes (solid drawn)	"	1/2½ to 1/3½	..
c " Wire, basis	"	1/-	..
c Copper Tubes (solid drawn)	"	1/3½	..
g " Bars (best selected)	per ton	£117	£3 inc.
g " Sheet	"	£117	£3 inc.
g " Rod	"	£117	£4 inc.
d " (Electrolytic) Bars	"	£96	£5 inc.
d " Sheets	"	£161	..
d " Wire Rods	"	£96	£5 inc.
d " H.C. Wire	per lb.	1/0½d.	½d. inc.
f Ebonite Rod	"	3/-	..
" Sheet	"	2/6	..
n German Silver Wire	"	2/6	..
h Gutta-percha, fine	"	11/-	..
h India-rubber, Para fine	"	2/5	½d. dec.
i Iron Pig (Cleveland warrants)	per ton	Nom.	..
i " Wire, galv. No. 8, P.O. qual.	"	£44	£3 inc.
g Lead, English Pig	"	£24	..
g Mercury	per bot.	£18 10 to £19	..
e Mica (in original cases) small	per lb.	9d. to 4/6	..
e " " " medium	"	5/- to 10/-	..
e " " " large	"	12/6 to 25-/6 up.	..
d Silicium Bronze Wire	per lb.	1/5	1d. inc.
r Steel, Magnet, in bars	per ton	..	..
g Tin, Block (English)	"	£249	£7 inc.
n " Wire, Nos. 1 to 16	per lb.	4/-	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

A New Splitdorf Magneto.—There are a number of interesting constructional innovations in this instrument. One of these is the use of a single square carbon brush. The new instrument shows a decided increase in sturdiness, the interrupter points, for instance, being noticeably heavier. Micarta gears are used and the distributor board is made of a new composition known as Americanite. The Mason principle of stationary windings and revolving poles is retained in the new instrument, which is unidirectional. Americanite is a new insulating material which the Splitdorf Company has discovered for use in electrical instruments, and which the company manufactures in its own plant. It is moulded similar to products of this nature, and in the case of the distributor block the contacts are moulded in with the Americanite. The Micarta not only is very quiet, but is long-lived as compared with metal.—*Aerial Age Weekly.*

Japanese Copper for Germany.—The Japanese Government Department for Commerce has given its consent to the resumption of the export of copper to Germany. Deliveries of Japanese copper will give immediate relief to the Rhenish-Westphalian and the Upper Silesian industries. But for the moment there is no shipping available.—*Zeitschrift für angewandte Chemie.*

Power Transmission by Magnetic Belts.—According to French Patent No. 487,380 of P. L. Weston, thin steel or iron belts are used on magnetised pulleys to transmit power. The magnetisation of the pulleys is effected by windings lying in helicoidal slots on the surface of the pulleys. The thickness of the belt should not exceed about 0.06 times the diameter of the smallest pulley. With a steel belt of ½ in. thickness making contact over an arc of 145 deg. on a pulley of 10-in. diameter running at 4,000 R.P.M., it is possible to transmit more than 200 H.P. per in. width of belt. With a pulley of 50-in. diameter running at 800 R.P.M., a belt of 1 in. width will transmit 1,000 H.P. Steel belts may be run at speeds of 18,000 ft. per min., so that this method of transmission is suitable for speed reduction with turbines.—*Revue générale de l'Electricité.*

TRADE STATISTICS OF NEW ZEALAND.

The following figures, showing the imports of electrical and allied goods into New Zealand in 1917, are taken from the official statistics which have recently reached this country. The figures for the previous year are given for purposes of comparison, and increases or decreases are noted. The country named is the country of origin of the goods.

	1916. £	1917. £	Inc. or dec. £
Leather belting.—			
From United Kingdom ...	4,000	3,000	– 1,000
,, United States ...	1,500	1,000	– 500
,, Other countries ...	2,500	6,000*	+ 3,500
Total	8,000	10,000	+ 2,000
*Australia £5,000.			
Belting, other than leather.—			
From United Kingdom ...	39,000	39,000	—
,, Australia	2,000	3,000	+ 1,000
,, United States ...	3,000	6,000	+ 3,000
Total	44,000	48,000	+ 4,000
Engine packing.—			
From United Kingdom ...	13,000	10,000	– 3,000
,, Australia	3,000	3,000	—
,, United States ...	7,000	8,000	+ 1,000
,, Other countries ...	1,000	—	– 1,000
Total	24,000	21,000	– 3,000
Scientific instruments.—			
From United Kingdom ...	4,000	2,000	– 2,000
,, United States ...	2,000	4,000	+ 2,000
,, Other countries ...	1,000	1,000	—
Total	7,000	7,000	—
Telegraph and telephone wires, iron.—			
From United Kingdom ...	1,000	—	– 1,000
,, United States ...	1,000	1,000	—
,, Other countries ...	—	8,000*	+ 8,000
Total	2,000	9,000	+ 7,000
* Canada.			
Generators, motors, and transformers.—			
From United Kingdom ...	46,000	35,000	– 11,000
,, United States ...	38,000	29,000	– 9,000
,, Other countries ...	2,000	2,000	—
Total	86,000	66,000	– 20,000
Electric batteries and cells.—			
From United Kingdom ...	10,000	1,000	– 9,000
,, United States ...	7,000	15,000	+ 8,000
,, Other countries ...	2,000	2,000	—
Total	19,000	18,000	– 1,000
Carbons and insulating material.—			
From United Kingdom ...	7,000	2,000	– 5,000
,, United States ...	3,000	5,000	+ 2,000
,, Other countries ...	1,000	1,000	—
Total	11,000	8,000	– 3,000
Other electrical material.—			
From United Kingdom ...	78,000	55,000	– 23,000
,, United States ...	52,000	36,000	– 16,000
,, Australia	2,000	2,000	—
,, Sweden	1,000	1,000	—
,, Other countries ...	7,000	5,000	– 2,000
Total	140,000	99,000	– 41,000
Telephones and accessories.—			
From United Kingdom ...	13,000	8,000	– 5,000
,, United States ...	11,000	20,000	+ 9,000
,, Other countries ...	1,000	10,000	+ 9,000
Total	25,000	38,000	+ 13,000
Meters, electricity.—			
From United Kingdom ...	12,000	5,000	– 7,000
,, Other countries ...	2,000*	2,000	—
Total	14,000	7,000	– 7,000
* United States £2,000.			
Lamps, electrical.—			
From United Kingdom ...	29,000	22,000	– 7,000
,, Holland	9,000	9,000	—
,, United States ...	8,000	17,000	+ 9,000
,, Other countries ...	—	1,000	+ 1,000
Total	46,000	49,000	+ 3,000
Steam engines.—			
From United Kingdom ...	41,000	31,000	– 10,000
,, United States ...	2,000	1,000	– 1,000
Total	13,000	8,000	– 5,000
Gas and oil engines (except for motor cars).—			
From United Kingdom ...	11,000	7,000	– 4,000
,, United States ...	21,000	23,000	+ 2,000
,, Other countries ...	6,000	4,000	– 2,000
Total	58,000	58,000	– 10,000
Boilers.—			
From United Kingdom ...	10,000	6,000	– 4,000
Insulated cable and wire.—			
From United Kingdom ...	156,000	58,000	– 98,000
,, United States ...	6,000	7,000	+ 1,000
,, Other countries ...	10,000*	12,000	+ 2,000
Total	172,000	77,000	– 95,000
* Japan £9,000.			
Mining machinery.—			
From United Kingdom ...	11,000	7,000	– 4,000
,, Australia	3,000	2,000	– 1,000
,, United States ...	6,000	4,000	– 2,000
,, Other countries ...	2,000	—	– 2,000
Total	22,000	13,000	– 9,000
Railway and tramway plant.—			
From United Kingdom ...	73,000	8,000	– 65,000
,, Australia	10,000	4,000	– 6,000
,, Other countries ...	11,000	—	– 11,000
Total	94,000	12,000	– 82,000

German Wireless Development.—According to *E.T.Z.* of March 13th, great improvements have been made in wireless communication during the war. It was found possible to keep up communications in both directions between Germany and the Colonies for at least six hours in the day, the best times being 6 to 11 a.m., and the best wave-length 5,500 m. With 100 kw. it was at times possible to reach Windhuk. The Goldschmidt machine at Eilvese gave much trouble and failed for long periods, nevertheless towards the end of the war it became much more reliable. Its capacity was increased to 800 kw.

The Nauen station, also with 800 kw. capacity, was most satisfactory in its operation. The relays were improved so as to enable 50 to 80 words to be transmitted per minute. One method of sending consists in taking two frequencies out of the same machine and causing these to interfere so as to give a note. This system is also in use, as an alternative, at the Pola station. Variations of the note are counteracted by a very sensitive speed regulator. The Nauen station has been greatly extended. The antenna has been raised by a second tower 260 m. high. Methods of double sending by two senders acting on one antenna tuned simultaneously to two wave-lengths have the advantage of attaining a greater degree of selectivity by the combination of the wave-lengths. New types of cathode-tube amplifiers rendered communication possible between firing trenches with very light apparatus. Blocking stations were used to interrupt the wireless communications of enemy aircraft. Directive stations were very successful in aiding Zeppelins to cruise over England, and it was even possible to guide a Zeppelin over Paris through a thick fog. Various improvements are referred to in arc transmitters, tube transmitters, high-frequency coils, receivers, relays, and antennæ.

Copper Scarcity.—Since Russia fell out of the war, stocks of copper in Japan have accumulated. This is a matter affecting in some degree the markets of the world, for the Russian demand having ceased, Japanese present prices do not admit of competition in other countries. Before the war, Japanese exports of copper amounted in value to Yen 25 million. With rapidly rising prices, this value increased to Yen 60 million in 1917. Of this quantity England took 25,000 tons against 14,000 tons in the previous year, while the Russian demand dropped to one half.

The shortage of copper, from which all Norway, but especially the electrical works of that country, has suffered through war conditions, no longer exists. America is now in a position to deliver the whole of the metal purchased long ago on Norwegian account. In consequence of this, the electrical works at Christiania have forbidden the continued use of zinc and iron as electrical materials. From July 1st, 1919, only copper is to be used for electrical purposes. The imports from America will include large quantities of line wire.—*Metall und Erz.*

THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

ANNUAL CONVENTION.

ON Wednesday the Annual Convention of the Association was to open at Ipswich; it was to continue on Thursday at Felixstowe, and will close to-day. As the exigencies of printing and distribution compel this journal to go to press on Wednesday, we are obviously unable to report the proceedings, but from the programme which we have already published it will be seen that in addition to the usual technical and commercial transactions, the social amenities which in pre-war days contributed so largely to the success of these conventions have now been restored; ladies are welcomed to the convention, and visits to works and other places of interest—notably Harwich Harbour, where surrendered German warships were to be inspected yesterday, and the Felixstowe Air (Sea-plane) Station to-day—have been arranged. We have no doubt that, given fine weather, the 1919 Convention will rank with any of its forerunners in point of interest and recreation, while the fact that it is the first peace-time reunion of municipal electrical engineers will go far to ensure a large attendance and a most enjoyable renewal of old friendships.

Mr. Ayton, whose various duties comprise, besides his functions as electrical engineer and tramways manager to the County Borough of Ipswich, those of President of the Association, chairman *and* hon. secretary of the Electric Vehicle Committee of Great Britain, is also acting as hon. secretary for the Convention; apparently, therefore, the 44-hour week does not appeal to him, and he loves work for its own sake—certainly during the past weeks he must have practised intensive production assiduously, and we trust that his efforts will be crowned with the unblemished success that they deserve. In his Presidential address, of which a slightly condensed report is given below, he blesses the Electricity Supply Bill—provided that it is amended to suit the wishes of the Association—and lays stress on the point to which we first drew attention when the Coal Conservation Committee's Report was about to be published*—namely, that while public bodies and Committees were pouring out proposals "to the end that an abundant supply of electricity shall be available for all classes of consumer," not a stroke was being done to develop the demand, without which such a supply would be a drug in the market. Central-station engineers may well be trusted to provide that abundant supply; but to build up the demand will not be the work of a day, and we cordially endorse Mr. Ayton's exhortations to them as managers and salesmen to set about preparing the market in good time.

It is true that the war provided an immense stimulus to the sale of electrical energy—for war purposes; but, as the President points out, the Armistice brought with it a heavy drop in the output. That, no doubt, will be partly made good as industry settles down to its normal lines, but in many places it will be a long time before the demand overtakes the facilities for supply already available. "Dora" no longer controls the situation. But "Eda" comes to the rescue—somewhat belated, for we have advocated her creation and invoked her assistance these ten years past—and in the Electrical Development Association we see, with Mr. Ayton, the instrument by which prosperity may be assured to the supply industry, provided that the industry gives its whole-hearted support and co-operation to the new organisation. The first essential to success is financial resources; the operations of the E.D.A. will be nation-wide, and it is but fair that all who benefit thereby shall bear a fair share of the cost. If, under existing powers, municipal undertakings find it difficult (though *not impossible*) to shoulder the burden, now is the time, when the Bill is going through Parliament, to take steps to ensure that the obstacles shall be removed, and that the authorities charged with the duty of supplying electricity shall be placed in a position to develop their undertakings *on commercial lines*. Mr. Ayton draws attention to the absurd restrictions imposed by some municipalities which own both gas and electricity undertakings upon the respective managers, restraining them from competitive efforts to develop their undertakings; could anything be more foolish or short-sighted? Competition is of the greatest value not only in fostering demand, but also in encouraging the pursuit of economies in working and organisation, and wilfully to discard this most potent factor of efficiency is a policy which calls for the severest censure.

Not only to the commercial side of the subject must station managers devote attention—there is also the sociological aspect to consider, a matter which has rightfully assumed a position of constantly increasing importance. This forms the subject of the paper by Alderman W. Walker, A.M.I.E.E., of which we give an abstract commencing on the next page.

Yesterday a discussion on "Electric Transmission Considerations," to be opened by Mr. S. L. Pearce, M.Sc., O.B.E., was to take place, and a paper by Bailie W. B. Smith, O.B.E., on "Valuing and Assessing Electrical Undertakings" was to be read and discussed. To-day the Annual General Meeting will be held, followed by a Special General Meeting to alter the Articles of Association. We see no reference in the programme to the Report of the Electric Vehicle Committee, which is usually submitted at the Convention, but presumably it will be presented to-day.

Mr. Ayton, in announcing Mr. H. Faraday Proctor's retirement from the position of hon. secretary, paid him a tribute of appreciation of the valuable services which he had rendered to the Association over so many years. We gladly seize the opportunity of associating ourselves with Mr. Ayton's remarks. Naturally the technical Press has been more or less continually in communication with Mr. Proctor, and while we have not always seen eye to eye with the Association, we have always met with the most kindly courtesy and consideration at the hands of the hon. secretary, who has shown every disposition to co-operate with us in promoting the welfare of the electricity supply industry. We feel that that industry, particularly but not solely on the municipal side, owes a debt of gratitude to Mr. Proctor for his untiring efforts and invaluable services. At the same time we tender our congratulations to Mr. A. C. Cramb on his appointment to the very honourable—and onerous—post vacated by Mr. Proctor.

* ELECTRICAL REVIEW, December 28th, 1917.

Presidential Address.

BY MR. FRANK AYTON,
Chief Electrical Engineer, Ipswich. (*Abstract.*)

THE fact that this is the first post-war Convention planned on the lines of pre-war days gives an added importance to the occasion, but still greater importance is attached to it by reason of the momentous changes that are on the eve of being made in the organisation of the electricity supply industry. Whatever may have been the effects of the war in other directions, posterity will concede that, as concerned the electrical industry, the war did good by bringing the nation to recognise, first, the importance of electricity supply, and, second, the general inefficiency and the drawbacks of the present methods of electrical generation and distribution, and to take active steps towards improvement.

During the war the majority of electric supply undertakings have carried on under difficult conditions, among which may be mentioned depletion of staffs, impossibility of always effecting repairs as needed, the ever-increasing demand, poor quality of fuel, shortage of plant, &c. The lot of the central-station engineer, especially in the case of those responsible for catering for industrial demands, has not been an altogether happy or enviable one, and the easing off in the output that followed the signing of the armistice came, therefore, in some ways as a rather welcome relief. While that memorable event released us from some of our war-time difficulties, it brought upon us at least one new one of a serious character, and that was the considerable falling-off in the industrial demand and the consequent declension in revenue. This is, of course, but a temporary condition which will right itself so soon as our industries can be re-established upon a normal peace footing, labour difficulties be composed, and the galling restrictions on export trade removed. Nevertheless, the reduction in revenue which has resulted, and which it was, of course, impossible to foresee when our estimates for the year were framed, has placed a number of undertakings, whose output was largely for industrial power, in a somewhat serious financial position. The incidence of the Fuel and Lighting Order has also been responsible for a not inconsiderable reduction in revenue from private resi-

dence and other consumers coming within the purview of its restrictions.

So much has already been said and written about the Williamson Committee's report and the Government Electricity Supply Bill, which, generally speaking, follows closely the main lines of the report, that it would be needlessly taking up time to make any detailed reference to the measure now before Parliament. The Association has put forward its criticisms of certain clauses and its recommendations for alteration and amendment, and it remains to be seen how far those recommendations will be adopted. If the Bill is altered as we desire it altered—and our suggestions for alteration are rather in matters of detail—and the important principle of public control is adhered to and safeguarded—then, in my opinion, there is little doubt that the carrying-out of its provisions will be of immense benefit to the nation, and in particular to the electricity supply industry.

The ultimate success of the measure will largely depend upon the choice of the Electricity Commissioners and the constitution of the District Boards. It is to be hoped that political influence will not be allowed to play any part in the appointment of the Commissioners, and that the latter will be chosen solely upon their technical and business qualifications and their suitability for the positions.

If the spirit of real business management and commercial enterprise can be breathed into the new organisation and maintained; if all that is done under the new regime has for its aim the national interest; if it can be kept free from the baneful effects of political wirepulling and exploitation, from a change in policy coincident with every change in the Government; then I have confidence that the placing of the Bill upon the Statute Book will be of immense advantage to the country. As for the electricity supply industry, it, at last, will have secured its Magna Charta, and have been freed from those legislative shackles which have for so many years impeded its free development in this country.

The need for the reorganisation and the co-ordination of electric supply has been abundantly proved. The electricity supply industry is now, as it were, part and parcel of the manufacturing organisation of the country; its future and its prosperity are indissolubly linked up with that of the nation's industries. To secure that the products of the latter may compete in the markets of the world, a cheap and abundant supply of electrical power is clearly one of the main necessities.

It was claimed by a speaker at a previous meeting of this Association that the actual cost of electric power to the industrial consumer represents but a small percentage of the whole cost of production in the factory, and that consequently the question of low price for power was not of so much real importance to the manufacturer as had been made out. That observation may be true in regard to certain industries, but as a general statement it is far from being correct. There is, for example, a wide difference in this respect between a clothing factory and an electrochemical works, between a printing works and a rolling mill.

In preparing to meet the demands of the future, a bold policy and the long and statesmanlike view are needed. We shall find ourselves sadly in error, and we shall seriously hamper industrial progress in those supply areas for which we are responsible, if we do not clearly visualise the altered conditions under which manufacturing operations will need to be carried on in the new era which is opening before us. These conditions will compel the use by the manufacturer of a considerably greater amount of machinery, and therefore power, per employé than has been the case in the past. Everything points to an enormous increase in the demand for electric power, which has proved to be far and away the most economical, convenient, and efficient means of driving machinery in the factory and the workshop, while the employment of electricity in other important industrial operations has become well established. The wonderful expansion in the use of electricity during the four and a half years of war is surely an index of what we may expect to have to meet in the way of increased demand in the future. The electric supply interests will be inexcusably lacking in foresight if they do not in good time prepare for this demand by the provision of ample generating plant.

While the conditions under which electrical energy is generated may be improved by the reorganisation of electricity supply upon national lines, the maximum of benefit will not accrue if we fail to recognise that the development of consumption is as important to the cheapening of electricity as the building of super-stations, linking-up, and the elimination of inefficient plants. The one is surely the obvious corollary to the other. The "business-getting" side of electric supply must be developed to a far greater extent than in the pre-war days.

In the great expansion in the use of electricity during the four and a half years of war, in all the eulogies upon its efficiency, convenience, and economy for industrial and other purposes that have come from authentic and official sources during that time, we have a great and valuable heritage to make use of in the intensive publicity campaign which, as the result of the formation of the Electrical Development Association, we have reason to hope may soon be inaugurated. One looks for great things from that association, and it must be a source of satisfaction to us that a well-known member of the I.M.E.A., Mr. J. W. Beauchamp, should have been chosen as its director. His appointment is, in itself, an augury of the successful results which may be expected.

I understand that an appeal is to be made by the Electrical Development Association, through the I.M.E.A., to all electric supply authorities for financial support, and one may express the hope that electric supply committees will respond to such appeal in a broad-minded and generous spirit. It ought surely to be the aim of every electric supply committee that the product of its undertaking should bring advantage and benefit to the greatest possible number of the inhabitants in the area. How, one may ask, can such aim be achieved otherwise than by keeping constantly before each prospective user, by means of appropriate publicity and propagandist effort, the merits and many uses of electricity? If we are to be in a position to supply electrical energy at the lowest possible price compatible with the business being conducted, as it should be, on sound commercial lines, we must secure outlets for its sale in every possible direction, its use for every purpose for which it offers advantages. The uses are innumerable, the advantages, financially and otherwise, of proved and unquestionable value. They require but to be made widely known to result in an enormous expansion in demand.

In the report of the Coal Conservation Sub-Committee of the Reconstruction Committee, dated April 17th, 1917, a most unjust aspersion was cast upon municipal electrical undertakings in the statement to the effect that more enterprise and progressiveness was manifest in the management of company-owned undertakings than in the case of those which are municipally owned. While there have been instances among municipally-controlled electric supply undertakings of apparent apathy in this matter of adopting what is generally recognised in commercial circles as a necessity to prosperity and progress in business, namely, "publicity," the underlying reason in these cases has seldom, if ever, been the indifference of the engineer responsible for the management of the particular undertaking, but the extraordinarily mistaken view which the ratepayers' representatives have taken where both electricity and gas are controlled by the same authority. There can be no greater error than to suppose that the interests of the municipality are best served by the arrangement which prohibits either undertaking from adopting every appropriate and possible means of publicity for the purpose of expanding its business. Competition should be permitted and encouraged to the fullest possible extent.

Whilst we must admit that there are those instances where modern propagandist methods have been taboo, there are not a few company undertakings against which the same reproach may be levelled, and where there is not the excuse for the management that has been mentioned above.

This Association can, I venture to think, point with some pride to its record of propagandist effort in the past. We may instance our offspring, the Electric Vehicle Committee, as so far the only successful co-operative effort in developing a particular use of electricity, and while one must acknowledge the great value of the services rendered by the representatives of the other constituent bodies upon that Committee, the fact remains that the credit for the inception of the movement, which is now having so marked a degree of success, belongs to the I.M.E.A., which, be it remembered, had also taken the initiative in the formation of an Electric Development Committee a short while prior to the outbreak of war. With Lieut.-Col. Vignoles as its hon. secretary that Committee, which was constituted upon the same co-operative lines as the Electric Vehicle Committee, gave promise of doing much good work, and no doubt would have done it but for the war, which brought its cause to an end in its inchoate stage.

There can, I think, be no question that the 12 months terminating with this Convention will rank in the annals of the Association as the busiest, most strenuous, and most important year in its existence. Members may gain from a perusal of the annual report some idea of the many important matters that have claimed the attention of your Council, in frequent instances calling for prompt decisions. One needs to be on the Council, however, to realise to the full extent the magnitude of the work accomplished, and in particular to understand how much the Association owes to its hon. secretary, Mr. H. Faraday Proctor, for his splendid services so ungrudgingly given, for his assiduous guarding of municipal electric supply interests, and for the valuable advice he has always been willing to place at the disposal of any member or local authority.

We must all feel regret that Mr. Proctor finds it necessary to relinquish the hon. secretaryship. Fortunately, the Council has been able to secure Mr. Proctor's consent to nomination as the hon. treasurer, so that his large experience in the affairs of the Association will still be at its disposal. I also think the Association is fortunate in having secured the acquiescence of Mr. Cramb to our nominating him as hon. secretary for the ensuing year.

The Whitley Report and the Electricity Supply Industry.

By ALD. W. WALKER, A.M.I.E.E.

(*Abstract.*)

Labour discontent was acute at the time of the outbreak of the war, but there were differences between, or, rather, additions to the demands then being made and those which

usually had been put forward. In addition to increased wages there were requests to be given a share in the control of the industry concerned, and a claim to be consulted regarding the working conditions within the industry. For a long time those demands, which may be looked upon as a natural result of extended education, had been growing more articulate and more insistent. The ideas concerning the extent of the control to be exercised ranged from the complete taking-over of all industries for and by the workers—through joint consultative committees of management—to the simple right of approaching the employer as and when some definite workshop grievance arose. The outbreak of war caused a temporary cessation of negotiations on the foregoing lines, all the demands centred on increased remuneration to meet the increased cost of living, and wages jumped to a hitherto unheard of height. At the same time, the Government was compelled by national necessities to take over some industries, to regulate others, and to control the supply of raw materials to all. To work these schemes the Government called representatives both of employers and employed to its aid, thus to a greater or less extent admitting the principle of joint control.

Plans to meet the conditions which would arise at the coming of peace were being considered by the Reconstruction Committee of the Cabinet, a sub-committee of which was dealing with the important subject of "The relations between employers and employed." This sub-committee was constituted of representative employers and trade unionists, and, after hearing much evidence, issued in March, 1917, an interim report, which immediately became a subject of great interest, much discussion, innumerable newspaper articles, and some criticism.

The principal recommendations of the Committee were:—

"1. The formation of National Joint Standing Industrial Councils in the several industries, composed of representatives of employers and employed, regard being paid to the various sections of the industry and the various classes of labour engaged."

"2. That District Councils, representative of the Trade Unions and of the Employers' Associations in the industry, should be created or developed out of existing machinery for negotiation in the various trades."

"3. That Works' Committees, representative of the management and of the workers employed, should be instituted in particular works to act in close co-operation with the district and national machinery."

The report contains definite suggestions as to the constitution and functions of the Joint Standing Industrial Councils. The *existing* Trade Unions and Employers' Associations are taken as the basis, but paragraph A3 says that new organisations should be admitted with the approval of the particular side of the Council of which the organisation would form a part.

The importance of the deliberations and the value to be given to the decisions of the Councils are clearly indicated in paragraph 21:—

"It appears to us that it may be desirable at some later stage for the State to give the sanction of law to agreements made by the Councils, but the initiative in this direction should come from the Councils themselves."

More important than any reconstruction of management machinery, more important even that the remedying of specific grievances, is the establishing of some degree of ordinary human touch and sympathy between management and men.

To post an order altering, say, the day for paying wages, find that it is resented, and must be withdrawn if a strike is to be avoided, is not nearly so good a method as that of consulting the Shop Committee, explaining the reasons for the alteration, and after getting the approval of the workers' representatives leave a short time for the latter to carry the explanation through the works before posting the formal notice. Delay in negotiating produces irritation, irritation causes bad temper, bad temper makes bad work.

Workshop Committees would not have powers to negotiate standard rates of pay, &c.; these would be fixed for the entire district by agreement between the Trade Unions and Employers' Association, or, when formed, by the National Councils.

This question of the relationship between employers and employed is a fundamental one. Many workers feel the burdens of their conditions, and are determined to satisfy their deeper needs, which education has both created and enabled them to explain; they wish to take an intelligent share in their work; they wish to know something of the ultimate outcome of their efforts; they desire to feel responsibility, to know why and wherefore, to receive such confidence as can be fairly given them, and, above all, to be consulted on those matters which most nearly touch them day by day.

The question of the effect on public undertakings of the acceptance of the recommendations made in the Whitley Report was a very important one, and local authorities had to consider the alternative methods for putting the proposals into practice which suggested themselves. It had to be decided whether to constitute a National Joint Council:—

1. For all municipalities and inclusive of all departments of each municipality.

2. For each separate department of all municipalities.

3. For some separate departments (gas, electricity, tramways, &c.), and some grouped (paving, cleansing, sewage, &c.)

4. For industries as industries inclusive of all undertakings whether municipal or company owned.

Those who studied the problem from the point of view of the industry with which the Convention is concerned, unanimously decided that the right solution was to establish a National Joint Council for the Electricity Supply Industry to include *all* authorised undertakings. Eventually, under the auspices of the Ministry of Labour, a conference of representatives of the employers and trade unions was held in Manchester on June 19th, 1918, Mr. Bridgeman, M.P., being in the chair. After a long discussion, a committee consisting of seven members from each side was appointed to draft a constitution for and to define the functions of a Joint Industrial Council. This Drafting Committee met several times at the Ministry of Labour, and unanimously decided to recommend the following draft constitution to its constituent organisations:—

JOINT INDUSTRIAL COUNCIL FOR THE ELECTRICITY SUPPLY INDUSTRY.

DRAFT CONSTITUTION.

To be submitted to the Constituent Associations.

PREFACE.

In a letter sent out by the Minister of Labour to the chief Associations of Employers and Workpeople on October 20th, 1917, the Minister announced that "the Government desire it to be understood that the Councils will be recognised as the official standing Consultative Committees to the Government on all future questions affecting the industries which they represent, and that they will be the normal channel through which the opinion and experience of an industry will be sought on all questions with which the industry is concerned."

In order to consider this suggestion with reference to the electricity supply industry, a conference was held between the employers' associations and the workpeople's associations concerned in the industry, at which it was decided that a joint committee be appointed to draft a scheme for an Industrial Council for the industry. Subsequently a meeting of representatives of the following workpeople's associations: Amalgamated Society of General Toolmakers, Engineers and Machinists; Electrical Trades Union; National Amalgamated Union of Enginemen, Firemen, Mechanics, Motormen, and Electrical Workers; Amalgamated Society of Gas, Municipal, and General Workers; National Amalgamated Union of Labour; National Union of General Workers; Workers' Union; Dock, Wharf, Riverside and General Workers' Union of Great Britain and Ireland; Steam Engine Makers' Society; United Machine Workers' Association, appointed seven representatives to the Committee. The following employers' associations: Incorporated Municipal Electrical Association; Incorporated Association of Electric Power Companies; Conference of the Chief Officials of the London Electric Supply Companies; Provincial Electric Supply Committee of the United Kingdom, also appointed seven representatives to the Committee.

The representatives appointed to the Drafting Committee were as follows:—

EMPLOYERS' ASSOCIATIONS.

Incorporated Municipal Electrical Association.—Messrs. F. Ayton, H. Faraday Proctor, and Ald. Walker.

Incorporated Association of Electric Power Companies.—Messrs. E. T. B. Murray and W. B. Woodhouse.

Conference of the Chief Officials of the London Electric Supply Companies.—Mr. C. P. Sparks.

Provincial Electric Supply Committee of the United Kingdom.—Mr. C. J. Wigham.

WORKPEOPLE'S ASSOCIATIONS.

Amalgamated Society of Gas, Municipal & General Workers.—Mr. E. Hallas.

Amalgamated Society of General Toolmakers, Engineers and Machinists.—Mr. G. Wilkinson.

Electrical Trades Union.—Mr. J. Rowan.

National Amalgamated Union of Enginemen, Firemen, Mechanics, Motormen and Electrical Workers.—Mr. George Parker.

Steam Engine Makers' Society.—Mr. W. F. Dawtry.

United Machine Workers' Association.—Mr. R. H. Contes.

Workers' Union.—Mr. W. T. Kelly.

This Joint Drafting Committee has met, and now submits the following scheme for your acceptance or otherwise:—

DRAFT CONSTITUTION AND FUNCTIONS.

I.—FUNCTIONS.

General Objects.—To secure the largest possible measure of joint action between employers and employés for the development of the industry as a part of national life and for the improvement of the conditions of all engaged in that industry.

It will be open to the Council to take any action that falls within the scope of this general definition. Among its more specific objects will be the following:—

1. The establishment of District Councils and Works Committees, and to define the functions and scope of such Councils and Works Committees, having regard in each case to any such organisations as may already be in existence.

2. The consideration of wages, hours and working conditions in the industry.

3. The consideration of measures for regularising employment.

4. The consideration of the existing machinery for the settlement of differences in the industry, and the establishment of machinery for this purpose where it does not already exist.

5. The consideration of measures for securing the inclusion of all classes of employers and employés in their respective associations.

6. The collection of statistics and information as and when agreed on matters appertaining to the industry.

7. Inquiries into special problems of the industry, including the comparative study of the organisation and methods of the industry in this and other countries, and, where, desirable, the publication of reports.

8. The encouragement of the study of processes and design and of research, with a view to perfecting the industry.

9. The provision of facilities for the full consideration and utilisation of inventions and any improvement in machinery or method, and for the adequate safeguarding of the rights of the designers of such improvement, and to secure that such improvement in method or invention shall give to each party an equitable share of the benefits financially or otherwise arising therefrom.

10. The improvement of the social and health conditions obtaining in the industry, and provision of special treatment where necessary for workers in the industry.

11. The supervision of entry into, and training for, the industry, and co-operation with the educational authorities in arranging education in all its branches for the industry.

12. The arrangement of lectures and conferences on subjects of general interest to the industry.

13. The issue to the Press of authoritative statements upon matters affecting the industry of general interest to the community.

14. Representation of the needs and opinions of the industry to the Government, Government Departments, and other authorities.

15. Co-operation with the Joint Industrial Councils for other industries to deal with problems of common interest.

16. The consideration of any other matters that may be referred to it by the Government or any Government Department.

II.—CONSTITUTION.

1. *Membership.*—The Council shall consist of 24 members, one-half appointed by Associations of Employers and the other half by Trade Unions.

Associations of Employers.	*No. of Representatives.*
Incorporated Municipal Electrical Association	6
Incorporated Association of Electric Power Companies	2
Conference of the Chief Officials of the London Electric Supply Companies	2
Provincial Electric Supply Committee of the United Kingdom	2
Total	12

Trade Unions.	*No. of Representatives.*
Amalgamated Society of Gas, Municipal and General Workers	1
Amalgamated Society of General Toolmakers, Engineers and Machinists	1
Dock, Wharf, Riverside and General Workers' Union of Great Britain and Ireland ...	1
Electrical Trades Union	2
National Amalgamated Union of Enginemen, Firemen, Mechanics, Motormen and Electrical Workers	1
National Amalgamated Union of Labour ...	1
National Union of General Workers	1
Steam Engine Makers' Society	1
United Machine Workers' Association ...	1
Workers' Union	1
Twelfth place to be left vacant for the present	1
Total	12

and such other organisations as may be added from time to time.

2. *Re-appointment.*—The representatives of the said Associations and Unions shall retire annually, and shall be eligible for re-appointment by their respective Associations or Unions. Each organisation shall have power to remove any of its own representatives at its discretion and to appoint another member to fill the vacancy. Casual vacancies shall be filled by the organisations concerned.

3. *Committees.*—The Council may delegate special powers to any Committee it appoints.

The Council may appoint Standing or Sectional Committees as may be necessary. It shall also have power to appoint other Committees for special purposes. The reports of all Committees shall be submitted to the Council for confirmation.

4. *Co-opted Members.*—The Council shall have the power of appointing on Committees or allowing Committees to co-opt such persons of special knowledge, not being members of the Council, as may serve the special purposes of the Council, provided that any appointed or co-opted members shall serve only in a consultative capacity.

5. *Officers.*—The officers shall consist of a Chairman and a Vice-Chairman, selected from the members of the Council, one from each side of the Council, and two Secretaries, one from each side of the Council, one of whom shall act as Treasurer.

6. *Meetings of the Council.*—The ordinary meetings of the Council shall be held as often as necessary, and not less than once a quarter. The meeting in the month of May shall be the annual meeting. A special meeting of the Council shall be called within seven days of the receipt of a requisition from either side. The matters to be discussed at such meetings shall be stated upon the notice summoning the meeting.

7. *Voting.*—The voting, both in Council and in Committees, shall be by show of hands or otherwise as the Council may determine. No resolution shall be regarded as carried unless it has been approved by a majority of the members present on each side separately of the Council.

8. *Quorum.*—The quorum shall be one half of the number of members on each side of the Council, inclusive of the secretaries.

9. *Finance.*—The administrative expenses of the Council shall be met in equal proportions by the Employers' Associations and Trade Unions represented.

10. *Amendment of Constitution.*—The Council shall have power from time to time to amend or add to the above constitution in such way as it may think fit, subject to confirmation by the constituent associations of the respective parties.

W. WALKER, *Chairman.*

At this date, March 22nd, 1919, the whole of the employers and all except one of the Trade Unions have notified their acceptance; the reply of the other is awaited.

It will be seen that this constitution is for the National Council only, leaving to such a Council, when formed, the work of creating or co-ordinating the duties of the District and the Workshop Committees. The necessity for a central authority for the industry cannot be questioned. The existing state of affairs is chaotic, and it would be advantageous to have regular joint meetings for the discussion of matters concerning the industry from a national instead of a sectional point of view. It is not proposed in this paper to go into all the details of the agreed constitution, but rather to leave them for the discussion. *One of the most important outstanding questions is that of whether or not plenary powers should be granted to the representatives on the National Industrial Council.*

DISTRICT COUNCILS.

The functions of the District Committees are not very clearly defined in the report. A letter circulated by the Rt. Hon. G. H. Roberts, M.P., Minister of Labour, in October, 1917, said:—

"In industries which are largely based on District Organisations it will probably be found desirable to assign more important functions to the District Councils than would be the case in trades which are more completely centralised in national bodies."

As the electricity supply industry came under the latter description, it appeared that the District Councils would not be of such importance as in some other industries. In addition to some of the functions enumerated in the draft constitution of the Joint Industrial Council, the District Councils would have to arrange to put into operation the findings of the National Councils, and also, presumably, would have the right to refer matters to that body. It would be advisable for them to arrange for close working with the education authorities of the district and to co-operate with the local District Industrial Councils of other industries when combined action was desirable in matters of common interest.

THE WORKS COMMITTEE.

The third recommendation of the Whitley Committee is the one possessing the greatest interest for the average member of an Electricity Committee because it is possible immediately to adopt it for any undertaking. It also has a more direct and immediate effect upon a department than either the District or National Councils. Workshop Committees have long been established in the engineering industry in the Manchester district, such firms as Messrs. Hans Renold, the British Westinghouse Electric & Manufacturing Co., and Messrs. Mather & Platt, &c., having had much experience of the working and of the good results arising from their establishment.

(To be continued.)

Electric Welding.—Welding experiments carried out by Mr. N. Czako, on several types of alloy steels were recently described in *E.T.Z.* A new kind of welding powder was used which contained neither borax nor iron filings, and the results of the experiments showed that the weldability of the types of iron and steel investigated was independent of their chemical composition, provided welding was carried out with a suitable welding composition which permitted of the union of pure metallic welding surfaces. By the use of a new welding powder of this type, it has been possible to make genuine welds in the ordinary forge with irons and steels which are generally recognised to be difficult to weld.

THE SOUTH AMERICAN MARKET.

[U.S. Commissioner's Review of the Position.]

It would appear that United States exporters have been overestimating to some extent the potential consumption of South American markets in electrical goods. In order to place the matter in proper perspective, the United States Trade Commissioner has reviewed the relative purchasing power of the principal consuming countries there. In summarising their physical characteristics, he points out that Argentina, Brazil, Uruguay, and Paraguay, being largely non-mountainous, are specially suited to cattle-raising and agricultural pursuits of various kinds.

Argentina and Brazil are, however, also making rapid advances industrially. All the west-coast countries are mountainous, containing the high peaks of the Andes, and abounding in mines, small and large, and in various stages of development. Some of the largest and most productive copper mines in the world are located in Chile, Bolivia, and Peru; hence much of the heavy machinery imported is for this group. On the north coast, Colombia and Venezuela have been making surprising progress in the last few years, and are now taking considerable quantities of insulated wire, lamps, and motors.

Of the three Guianas, British Guiana is the only one that consumes electrical goods, and that only in small quantities.

Trend of Trade During the War.

In 1913, the best year previous to the war, the total imports of electrical goods into South America amounted to approximately £4,450,000, and of this sum the share of the United States was £920,000, these figures having been taken from the statistics of the several foreign Governments. It is interesting, in passing, to make a comparison of the American share with the shares of England and Germany, the two other principal competitors, during the same period. They were, respectively, £1,080,000 and £2,000,000. On account of the world crisis, since that date, the relative positions of the exporting nations have undergone a radical change, and the United States is now the leader, with exports, according to statistics compiled by the Department of Commerce, of £1,956,000 for the year ended June 30th, 1918. This represents a decided increase in percentage of total imports.

The following table gives the electrical-goods imports of the principal South American countries, showing the amounts furnished by England, Germany, and the United States for the calendar year 1913, and the latest normal year, and the amounts sent from the United States to each country of South America for the year ended June 30th, 1918:—

Countries.	South American imports of electrical goods in 1913.				Exports of electrical goods from U.S in 1917-18.
	Total.	From United Kingdom.	From Germany.	From United States.	
	£	£	£	£	£
Argentina ...	1,951,247	671,743	978,508	115,426	525,233
Bolivia ...	122,405	40,069	59,493	1,185	6,705
Brazil ...	1,700,904	284,192	595,498	647,913	636,604
Chile ...	457,659	69,249	327,243	38,967	432,578
Peru ...	44,792	1,847	14,823	25,247	129,459
Uruguay ...	46,142	6,149	9,969	9,887	87,623
Venezuela ...	41,500	5,000	1,172	27,587	47,745

Measure of Purchasing Power.

The mistake is often made of taking it for granted that the average consuming capacity per capita is the same in South America as in North America. This is not true. Peru as a market for electrical goods is no better than an American purchasing public of 100,000 people. This includes both the people as a whole and the foreign mining interests, whose annual business is a large proportion of the total. This is one of the extreme cases, but the same sort of allowances must be made for all countries. The countries having the best purchasing power are, generally speaking, those on the east coast—Brazil, Argentina, Uruguay, and Paraguay.

Great Possibilities in Brazil.

The consumption of electrical goods in Brazil is steadily growing, and before many years it will surpass that of any other South American country. With a population of approximately 25,000,000, and resources of a very varied character, Brazil will have a more diversified demand than it has at present. Mines will be developed, numerous industries have been established already, and steam railroads will be electrified.

An indication of the extent to which electric power is used in the industrial life of Rio de Janeiro and Sao Paulo will be had from the statistics of the central stations, which show that in Sao Paulo there is over 50,000 H.P. in electric motors connected to the circuits, and in Rio de Janeiro there is over 100,000 H.P. connected. The normal yearly increase may be taken at not less than 5,000 H.P.

Already there are a number of mines in operation, and indications are that in the near future active work will be begun in the great iron ore district in the State of Minas Geraes. Judging by the size of the known deposits, and the importance of the companies owning them, it is evident that when this development takes place there will be required a large amount of modern mining and power machinery.

The railway that will tap this iron ore district, known as the Victoria-Minas Railroad, will be electrified for a length of several hundred kilometres. Plans have been completed already for electrifying a large portion of the Paulista Railroad in the State of Sao Paulo, and other roads are expected to follow this example.

The power for all these enterprises will be furnished by waterfalls, which are abundant in this particular section of Brazil.

There are a number of telephone companies, some of which are provided now with modern equipment, although most of the smaller ones will be needing new material to take care of their natural expansion. The more important companies are located in Rio de Janeiro and Sao Paulo, and are owned by the Brazilian Traction, Light & Power Co. They have about 40,000 subscribers, their yearly increase being approximately 10,000 instruments.

There are street-railway systems in Manaos, Para, Ceara, Bahia, Rio de Janeiro, Nictheroy, Sao Paulo, Santos, Porto Alegre, Pelotas, and Rio Grande. With the exception of the last, which is a very small company, they all use English or American equipment exclusively.

The small household devices used for heating and cooking are being introduced energetically, and will enjoy an increasing popularity with dealers in electrical goods. In all the cities the dealers are very progressive, and both they and the central stations are engaged in active propaganda for the wider use of electrical material of all kinds.

Argentine's Needs for the Immediate Future.

At the present time, and perhaps for the immediate future, Argentina offers the best market in South America for electrical goods, owing to the fact that it is capable of easy development and produces articles of such prime necessity throughout the world as grain, wool, and beef. It is expected that its progress will be more rapid than that of other countries that have more difficult transportation and production problems, and its point of maximum ability to absorb electrical goods will be reached while Brazil is still in the early stages of its development.

Argentina is handicapped in not having available for development any large amount of water power. Several of the interior cities, such as Tucuman and Cordoba, have hydro-electric plants, but these are furnishing practically all the power of which they are capable. The only large waterfall is the Iguassu, half of which may be ceded to Argentina, since it is on the boundary between that country and Brazil. As was pointed out, however, this is too far away to be of any use in the industrial development of either country.

A large number of small telephone companies operate in the various towns and cities, and have a total of approximately 50,000 subscribers.

Street-railway companies in Buenos Aires and other cities have an aggregate of 2,500 motor cars, equipped almost exclusively with English and German motors and controllers. Many extensions are contemplated, and the repair and supply business is one of considerable volume.

One of the steam roads has electrified one of its suburban lines for a distance of 30 kilometres, and contemplates further electrification in the near future. Two other railways have made some progress toward electrification, one of them having installed its power plant and third rail. All these are English-owned companies, and employ a firm of English consulting engineers to take charge of this work.

The retail dealers in electrical goods are progressive and handle all kinds of miscellaneous devices, as well as standard lines of wire and wiring supplies. These two items are the principal lines in the electrical trade, but with the assistance of the central stations there is being created a demand for heating and cooking devices, and the more modern forms of lighting equipment.

There is little of interest in Uruguay outside the city of Monte Video, since the central stations in the interior are of very small capacity, and many of them operate only during the night time, which practically excludes all household devices and motors. There are no waterfalls, as the country is comparatively flat.

Telephones and Lighting in Uruguay.

The telephone companies, of which there are approximately 20, are now owned privately, but the Government intends to take them over, under its policy of declaring all public utilities to be State monopolies. There are approximately 18,000 instruments in use, of which 10,000 belong to the two companies operating in Monte Video.

There are two street-railway companies, with 400 motor cars. The Government has bought a mule-car line, and intends to electrify it in the near future.

Monte Video is one of the few cities still lighted by arc lamps, of which there are now approximately 2,000 in ser-

vice. It is expected that these will be replaced by a system of incandescent lighting before very long.

Growing Importance of Chilean Market.

Chile, although one of the smaller countries, offers one of the best three markets for electrical goods. It has large and active mining enterprises, and quantities of electrical material are employed in its nitrate fields. Many industries have been established under the stimulation of the abnormal conditions of the last few years, and everything possible is being done to extend them.

In the section from Coquimbo to Valdivia there is an abundance of water power, and the Government has created a commission to study the possibility of constructing a longitudinal artery for the transmission of power throughout this stretch. If this can be done successfully, it will make available a large amount of cheap power, which, in turn, will greatly encourage the establishment of more industries. The two larger central stations are in Santiago and Valparaiso.

There are several smaller independent telephone companies, but most of the more important places are controlled by the Chile Telephone Co. It is preparing to replace much of the older equipment with more modern material.

The Chilean Government has taken steps already looking toward the electrification of three sections of its railway system, and if the entire programme is carried out it will mean the installation of a large quantity of generating and power apparatus.

Minor Openings.

The only users of electrical material in quantity in Bolivia are the mining companies, and as these have been enjoying several years of prosperity they will probably purchase more heavily than ever in the near future. Each has its own generating plant, operated by water-power or petroleum engines. The number of motors installed is being increased constantly. Personal representation is necessary to obtain this business.

For domestic purposes, electric devices are confined to three or four towns, since the greater portion of the population consists of Indians and half-breeds, who will never become users of this material. Under present conditions, there is little opportunity for the sale of anything but lamps and wiring material.

Electric power is used in the large and small mines of Peru, the oil fields, and the sugar plantations, all of which are following a programme of expansion as fast as conditions will permit. In or near Lima a number of small industries also use electric power, and the central station is quite active in securing new customers.

The street-railway system in Lima and Arequipa, and the telephone company in Lima use American material exclusively. The Central Railroad has been making studies of the electrification of its line, but apparently has not found that conditions warrant such a movement.

A great majority of the inhabitants are Indians and half-breeds, living in the high inland plateau, so that the consumers of household and miscellaneous devices are confined to not more than 15 per cent. of the population.

In Ecuador there are some 20 central stations, and outside of Guayaquil, where there are a few small industries using power, the electrical goods that can be sold are confined entirely to lamps and wire and wiring devices. The purchasing population is extremely small.

THE SALVAGE OF LECLANCHÉ CELLS.

By W. J. THORROWGOOD.

(*Abstract of paper read before the* INSTITUTION OF RAILWAY SIGNAL ENGINEERS (INCORPORATED).

THE author describes a process which he has introduced on the London and South-Western Railway, and which has given satisfactory results so far.

Generally, before the war, manufacturers were unwilling to allow a rebate on returned porous pots and their contents, or spent dry cells that had been put out of service. They can obtain new carbon plates, pyrolusite and carbon granules at less cost than would be incurred in collecting and recovering the useful material from porous pots.

In view of the increased cost of new porous pots and dry cells since 1914, and the difficulty of obtaining them of the same quality and to the same specification (pyrolusite was for a short period unobtainable), it seemed to the author that it might be economical to treat the old porous pots which had been put out of service, by washing, either as they were, or by unsealing the top and washing the porous pot and the contents separately and then reassembling. Neither method gave very satisfactory results, and the second was costly owing to the labour charges.

Analysis of the contents of porous pots supplied before the war, that had been in use, showed that the volume of carbon and pyrolusite, 50 per cent. of each, remained the same and the quality of pyrolusite (85 to 90 per cent. of manganese) was practically unaltered, but the damp mixture had an alkaline reaction.

Six discarded porous pots, taken at random, were treated according to the following process:—

A solution of commercial hydrochloric acid one part and water five parts is placed in six glass jars, so that when a porous pot stands in the jar the solution comes nearly up to the black rim at the top of pot. The porous pot remains in the solution for 24 hours. It is then washed and soaked in clean water for 48 hours, the water being changed after 24 hours' immersion. The cell is then ready for use in the ordinary way. The acid solution can be used three or four times.

Each of the six cells was joined up to repeaters, having 300 ohms resistance, and tested against a new cell, of standard quality, for seven weeks. The cells were then left standing for five and a half months, when the voltages of the cells were taken and recorded.

The six chemically treated cells were then joined in series with two new ones of standard quality to form a battery of eight cells, which was put in service on April 25th, 1917, on an electric fouling-bar circuit at Gunnersbury. This circuit consists normally of an indicator, 3,000 ohms resistance, and a Syx D.A. lock 30 ohms; the latter was brought into use every time the lever was operated. The circuit was a heavily worked one, and the battery remained in service until October 30th, 1917, when the current in the electric lock circuit was 400 M.A., the minimum current allowed for lifting the lock. The battery was then put out of service.

The cells were again chemically treated on January 16th, 1918; the voltage of the two new cells that were used for comparison had fallen to 1.3 volts. One of the treated cells on testing gave 1.3 volts, but the voltage of the other five treated cells had fallen to from .9 to 1 volt. The zinc rods used in the cells containing the chemically treated porous pots remained freer from crystallised salts and were generally cleaner than the zincs in the new cells.

This method has been extended, and up to March, 1919, 3,653 porous pots were treated, and 2,650 had been put into service, so far with satisfactory results. At one or two large depots vessels have been provided, in which from 30 to 40 spent porous pots can be treated at one time.

It is, of course, not to be expected that every porous pot can be renovated, as in some cases it is found that the carbon plate is broken, or the terminals of the carbon plate may be loose. An effective method of overcoming this difficulty is to drill a hole through the lead and carbon plate and fill the hole with solder.

Good results have been obtained by treating the porous pots with the chemical solution before they are useless and when the voltage of the cell on open circuit has fallen to 1.2 or 1.1 volts.

By using the interiors of spent dry cells as porous pots, very successful results have been obtained. The Dania Dry Cell C.S. size is largely used. The general practice is to use these cells on important circuits until they give on testing 1 to 2 amperes momentarily, and then to use them on unimportant circuits until entirely spent; at this point the whole is discarded.

To render the sac interiors of these spent cells suitable for use in place of porous pots, the zinc case is removed and the jelly washed away, leaving the interior to dry. A little of the pitch recovered from the old dry cell is heated and placed on the top of the sac and around the carbon rod, or the top of the sac and carbon rod when dry are varnished with an insulated varnish or paraffin wax to prevent the salts from creeping. The sac is then ready for use as a porous pot with the ordinary zinc rod and salammoniac solution in a glass jar, to form a Leclanché cell. If a spent interior after being washed does not give satisfactory results on testing, it is submitted to the hydrochloric acid process similarly to a spent porous pot, but for a shorter period.

A battery of Leclanché cells in which the interiors of 12 spent dry cells, treated as above described, were used as porous pots was installed on a busy telephone circuit from Exmouth Junction to Exeter, on which were 10 telephone instruments, on September 21st, 1917. Each of the cells was tested after three months' work on December 21st, 1917, and again after a further three months' use. All the cells, except No. 10, were then in good working order; the fault was subsequently found to be due to a broken carbon. Another cell was put in to replace No. 10, and the battery is still in service.

Up to March 31st, 1919, 4,165 interiors of spent dry cells were treated as above described; 2,821 were in use replacing porous pots in Leclanché cells on various kinds of circuits, so far satisfactorily.

Circuits may be divided into important and unimportant circuits, and the treated porous pots can generally be used on the latter. Approximately 95 per cent. of the spent dry cells can be made useful. Loose lead terminals and broken carbon plates account for the remaining 5 per cent.

It is found that one quart of hydrochloric acid is sufficient to treat 36 porous pots. The average total cost of material and labour (including war wage) of treating one porous pot is twopence.

Spent interiors of dry cells cost 2.5d. each to render useful, owing to more labour in cleansing being required. When treating porous pots in bulk, say, about 40 at a time, the cost works out at 1.5d. each. It is estimated that the value of a treated porous pot or a treated interior of a spent dry cell is approximately from 50 per cent. to 66 per cent. that of a new porous pot. Before the war the price of No. 1

porous pots was 5.16 pence; of No. 2 porous pots 3.99 pence each. At present the cost of No. 1 is 14.2 pence, and No. 2 is 8.2 pence. Therefore there is an ample margin between the price of new cells and the cost of renovating porous pots or interiors of spent dry cells, even in peace times, to justify the use of this process or a similar one.

Details of the test results are given in the paper.

NEW PATENTS APPLIED FOR, 1918.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS SEFTON-JONES, O'DELL AND STEPHENS (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

13,884. "Electric power generating sets." H. R. RICARDO. June 2nd.

13,909. "Device for electrical illumination for theatrical and stage effects. &c." T. H. ROCHFORD. June 2nd.

13,919/20. "Sparking plugs." H. R. WICKS. June 2nd.)

13,954. "Automatic telephone systems." W. C. DAVEY & STERLING TELEPHONE & ELECTRIC Co., LTD. June 2nd.

13,965. "Apparatus for transforming alternating current into continuous current for charging accumulators." N. SAMSSONOW. June 2nd.

13,968. "Electric signal devices for railways." S. H. CHILDS. June 2nd.

13,986. "Secondary dry battery." F. A. VAN HOOYDONK. June 2nd.

13,997. "Electric lamp fittings." G. P. FAIRLESS. June 2nd.

13,998. "Covers for electric switches, bell pushes, &c." J. A. BOWER. June 2nd.

14,029. "Electric turbine." D. SUCHOSTAWER. June 4th.

14,033. "Impregnation of electric cables, transformers, &c., and fibrous material used therein with insulating medium." BRITISH INSULATED & HELSBY CABLES, LTD., and J. LEWIS. June 4th.

14,063. "Electrical ironing, cooking, heating, &c., apparatus." P. P. MEUNIER. June 4th. (France, June 4th, 1918.)

14,068. "Electric relays and relay circuits." L. B. TURNER. June 4th.

14,071. "Brush holder for electric machines." W. S. BULFITT & W. J. DENHOLM. June 4th.

14,087. "Vacuum tube for use as detector, amplifier, or generator of wireless waves, &c." J. SCOTT-TAGGART. June 4th.

14,110. "Electric switches." A. P. RUTHERFORD. June 4th.

14,111. "Preparing aluminium or its alloys for electro-plating." H. D. CUNNINGHAM. June 4th.

14,163. "Fittings for metallic electric conduits." F. S. RIPPINGILLE. June 4th.

14,167. "Electric fuse-holders." IRONCLAD SWITCHGEAR Co. & E. W. MORGAN. June 4th.

14,168. "Electric switches." IRONCLAD SWITCHGEAR Co. & E. W. MORGAN. June 4th.

14,191. "Telephone receivers." R. L. MURRAY & TELEPHONE MANUFACTURING Co. June 4th.

14,192. "Electrical furnaces." E. P. BARFIELD & L. W. WILD. June 4th.

14,205. "Electric selective signalling, &c., systems." F. R. BALDOCK & INTERNATIONAL ELECTRIC Co. June 4th.

14,213. "Means for securing permanent magnets of electrical measuring instruments of the moving coil type." ELLIOTT BROS. & W. PHILLIPS. June 4th.

14,224. "Automatic or semi-automatic telephone systems." AUTOMATIC TELEPHONE MANUFACTURING Co. June 4th. (U.S.A., September 5th, 1918.)

14,225. "Automatic or semi-automatic telephone systems." AUTOMATIC TELEPHONE MANUFACTURING Co. June 4th. (U.S.A., October 23rd, 1918.)

14,251. "Wireless telegraphy systems of the arc gap type." L. T. BARKERS. June 5th.

14,305. "Direct current dynamo-electric machines." B. J. SHILLITO. June 5th.

14,309. "Wireless signalling systems." BRITISH THOMSON-HOUSTON Co. (General Electric Co., U.S.A.) June 5th.

14,315. "Electric heating apparatus." C. G. NOBBS & M. J. RAILING. June 5th.

14,316. "Cable splices." N. K. BOWMAN. June 5th.

14,318. "Electric starters for internal combustion engines." A. H. MIDGLEY & C. A. VANDERDELL & Co. June 5th.

14,325. "Insulators for conductor rails, &c." E. H. MEYRICK. June 5th.

14,348. "Secondary batteries." T. D. GREELEY & VICKERS, LTD. June 5th.

14,350. "Electric transformers." F. R. BAERLOCHER & VICKERS, LTD. June 5th.

14,351. "Means for directing fire of ground batteries from aircraft." H. J. FINER. June 5th.

14,354. "Electrical system for generating intermittent high-tension current impulses for ignition purposes, with or without low-tension current for battery charging, lighting, &c." C. H. TOWER. June 5th.

14,358. "Apparatus for practising clock code or co-ordinate signalling between aircraft and ground batteries on electrically controlled counter battery schemes, &c." H. J. FINER. June 5th.

14,365. "Dynamo machines." F. SHAW. June 6th.

14,367. "Sparking-plugs for internal combustion engines." F. A. JENNINGS. June 6th.

14,374. "Insulating and anchoring device for electric lampholders, &c." B. DEAKIN. June 6th.

14,392. "Sparking-plugs for internal combustion engines." A. FARRINGTON & G. M. NICKLIN. June 6th.

14,409. "Mixed manual and machine switching telephone exchange systems." G. DEAKIN & WESTERN ELECTRIC Co. June 6th.

14,417. "Sparking-plug for internal combustion engines." G. H. NEGUS. June 6th.

14,422. "Electric condensers." R. W. WINN. June 6th.

14,427. "Electric railways." BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING Co. June 6th.

14,428. "Device for electrically lighting cycles, &c." W. A. HYMAS. June 6th.

14,432. "Method of springing overhead arm of tramcars, &c." H. L. REILLY. June 6th.

14,462. "Negative plate for electric batteries." A. POUCHAIN. June 6th.

14,463. "Negative plate for electric accumulators." A. POUCHAIN. June 6th.

14,464. "Incandescent lampholder." J. P. JOHANSSON. June 6th.

14,471. "Control of electric installations." H. CROCHAT. June 6th.

14,477. "Manufacture of electric heaters." W. O. MILLER. June 6th. (Switzerland. March 26th.)

14,525. "Insulated wire stripper." S. A. GOAD. June 7th.

14,543. "Attachment for electric holders in motor lamps, &c." O. T. BANES. June 7th.

14,559. "Method of electrically and mechanically connecting electric accumulator cells, storage and primary battery cells, electrolytic cells, &c." R. C HOUSTON. June 7th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1916.

3,250. SUBMARINE SOUND SIGNALLING APPARATUS AND THE LIKE. H. L. De Skinwith and T. F. Wall. March 3rd, 1916. (Complete accepted March 13th, 1917. Patent sealed March 12th, 1917.) (126,654.)

15,072. VACUUM TUBES OF THE AUDION TYPE. M. Peri & J. Biguet. October 23rd, 1915. (126,658.)

1917.

1,636. ELECTROLYTIC PRODUCTION OF METALLIC TUBES WITH A CLOSED END. S. O. Cowper-Coles. February 1st, 1917. (126,667.)

1,902. MANUFACTURE OF CARBONS FOR ELECTRIC ARC LAMPS. W. Heape and H. B. Grylls. February 5th, 1917. (126,673.)

2,011. SAFETY SPARK GAPS FOR MAGNETO-ELECTRIC MACHINES. British Thomson-Houston Co. & A. P. Young. February 9th, 1917. (126,681.)

2,280. MANUFACTURE OF ELECTRIC SIGNALLING AND OTHER LAMPS. O. Lucas, G. S. Hague and G. E. F. Goold-Adams. February 15th, 1917. (126,695.)

2,294. ELECTRICAL SIGNALLING APPARATUS. Sir S. T. Dawson and Sir G. T. Buckham. February 15th, 1917. (126,696.)

2,779. ELECTRIC HEATER OR HEATERS FOR USE WITH INTERNAL COMBUSTION ENGINES. C. G. Nobbs and Falkirk Iron Co. February 26th, 1917. (126,719.)

16,677. ELECTRICAL TRANSFORMERS FOR REGULATING OR VARYING THE VOLTAGE OF THE CURRENT SUPPLIED THEREFROM. F. E. Berry. November 13th, 1917. (126,744.)

18,533. HEADGEAR FOR TELEPHONE AND OTHER ACOUSTIC RECEIVERS. H. W. Metcalfe. December 13th, 1917. (126,746.)

1918.

2,685. ELECTRIC SELECTIVE SWITCHING SYSTEMS AND APPARATUS. International Electric Co. and F. R. Baldock. February 14th, 1918. (126,755.)

2,745. ELECTRIC DISTRIBUTION SYSTEMS. British Thomson-Houston Co. and J. Whitcher. February 15th, 1918. (126,757.)

4,689. ELECTRIC CELLS OR BATTERIES. E. Baur and W. D. Treadwell. March 16th, 1918. (126,766.)

7,974. SOUND AMPLIFYING DEVICE FOR TELEGRAPH RELAYS. C. F. Hilton, May 13th, 1918. (126,779.)

8,002. ELECTRIC MOTOR CONTROL SYSTEMS. L. Miller & British Westinghouse Electric & Manufacturing Co. May 13th, 1918. (126,781.)

8,038. ELECTRIC WATER HEATERS. L. O. Meyer. May 14th, 1918. (126,783.)

8,129. ELECTRIC BATTERY CELLS. H. R. Pearson. (May 15th, 1918. (126,790.)

8,169. ELECTRIC SWITCHES. H. Garde & C. G. Bennett. May 15th, 1918. (126,794.)

8,176. CHARGING BOARDS FOR ELECTRIC ACCUMULATORS. H. Leitner & W. H. Exley. May 15th, 1918. (126,795.)

8,226. ELECTRICALLY OPERATED HOISTING MACHINERY. G. Ellison and J. Anderson. May 16th, 1918. (126,800.)

8,293. ELECTRIC HEATING STOVES. H. A. Cope (Soc. Anon Hecla). May 17th, 1918. (126,806.)

8,324. ELECTRIC ENGRAVING PENCILS. A. M. Robinson and R.I. Electrical Instrument Co. May 17th, 1918. (126,808.)

8,607. ELECTRIC HAND LAMPS. J. Bein. May 24th, 1918. (126,820.)

8,793. TROLLEY HEADS OF ELECTRICALLY PROPELLED VEHICLES. C. W. Collins. May 28th, 1918. (126,826.)

9,579. APPLIANCE FOR FACILITATING THE RE-ENERGISATION OF LUMINOUS PAINT SURFACES BY MEANS OF AN ELECTRIC TORCH. A. B. Gibbons and Eiandem Co. June 11th, 1918. (126,838.)

9,740. IGNITION SYSTEMS FOR INTERNAL COMBUSTION ENGINES. A. H. Midgley and C. A. Vandervell & Co. June 13th, 1918. (126,840.)

10,160. ELECTRICAL SWITCHES. Ferguson, Pailin & Co., S. Ferguson & G. Pailin. June 20th, 1918. (126,847.)

10,673. SPARKING PLUGS FOR INTERNAL COMBUSTION ENGINES. B. Hopps, A. M. Lodge & Lodge Sparking Plug Co. June 28th, 1918. (126,852.)

11,485. LEADING-IN CONDUCTORS FOR INCANDESCENT ELECTRIC LAMPS AND OTHER VACUUM TUBES. K. Ohtani. July 12th, 1918. (126,859.)

12,042. STARTERS FOR ELECTRIC MOTORS. A. H. Railing, C. C. Garrard, P. H. Jackson and C. Bonner. July 24th, 1918. (126,864.)

16,911. ELECTRIC STARTING MOTORS FOR INTERNAL COMBUSTION ENGINES. H. Lucas, C. L. Breeden and H. N. Urquhart. October 16th, 1918. (126,898.)

17,513. HIGH FREQUENCY ALTERNATORS. Soc. Francaise Radio-Electrique. October 26th, 1917. (Addition to 102,738.) (120,888.)

1919.

2,393. ELECTRICAL CONDENSERS AND MOUNTINGS THEREFOR. Bosch Magneto Co. February 11th, 1918. (123,908.)

2,847. DEVICE FOR VARYING THE POINT OF IGNITION IN ELECTRICAL IGNITION APPARATUS. Akt. Ges. Brown, Boveri et Cie. February 5th, 1918. (Addition to 9,959/18). (123,001.)

New Method of Smelting Iron Ores.—An article in *Canadian Machinery*, of April 3rd, deals with the smelting of many kinds of iron ores, especially prevalent in Canada, which do not admit of economical reduction in the blast furnace. The ore is first reduced to a sponge, which is then transferred to an electric furnace and melted down and finished. The process is particularly applicable to iron, steel, and ferro-alloys. The author shows that iron ore of 65 per cent. or more metal content is increasingly difficult to obtain from the larger fields, and advises the exploitation of the numerous small deposits along the Great Lakes by means of electric furnaces driven by hydro-electric plant. In conclusion, details are given with regard to the commercial possibilities of iron ore treated in the manner described, the points which should be embodied in the design of suitable furnaces, and the method and process claims included in the author's patents on the treatment of ores in this way.